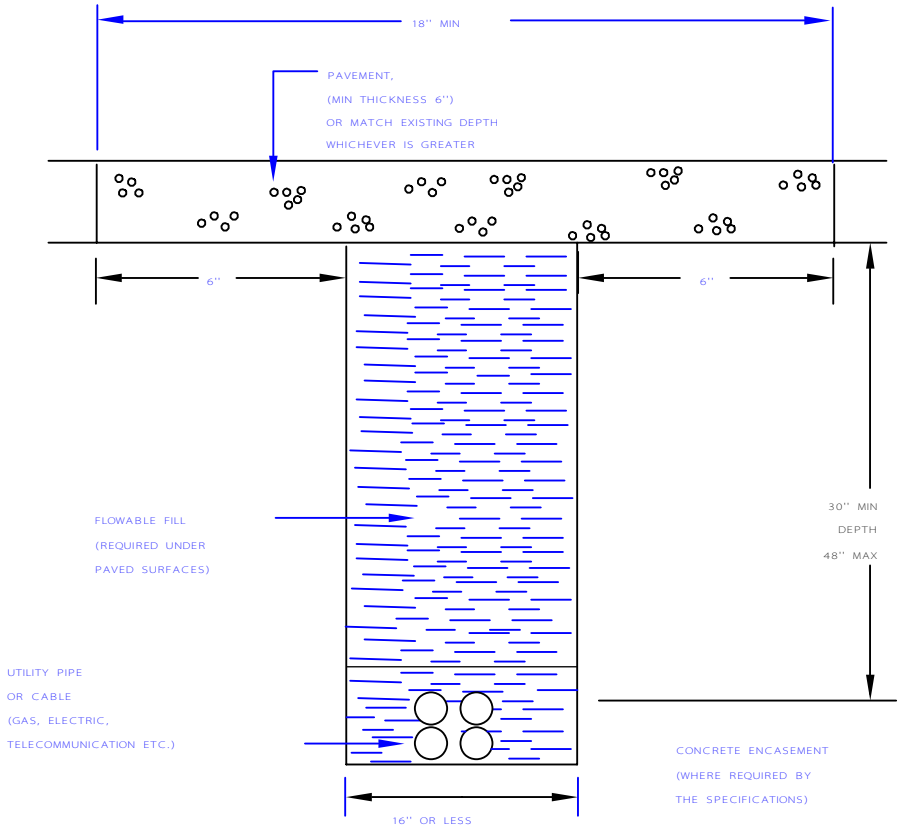
UNIVERSITY OF COLORADO
DESIGN AND CONSTRUCTION STANDARDS
TECHNICAL DRAWINGS

TABLE OF CONTENTS

C.39 Tunnel Penetration Sealing (Live Utilities)
C.40 Tunnel Penetration Sealing (Abandoned Utilities)



NOTE: IF TRENCH WIDTH IS WIDER THAN 16'' USE UTILITY TRENCH DRAWING NO. C.02

DRAWN BY:

CHECKED BY:

APPROVED BY:

University of Colorado

UTILITY TRENCH

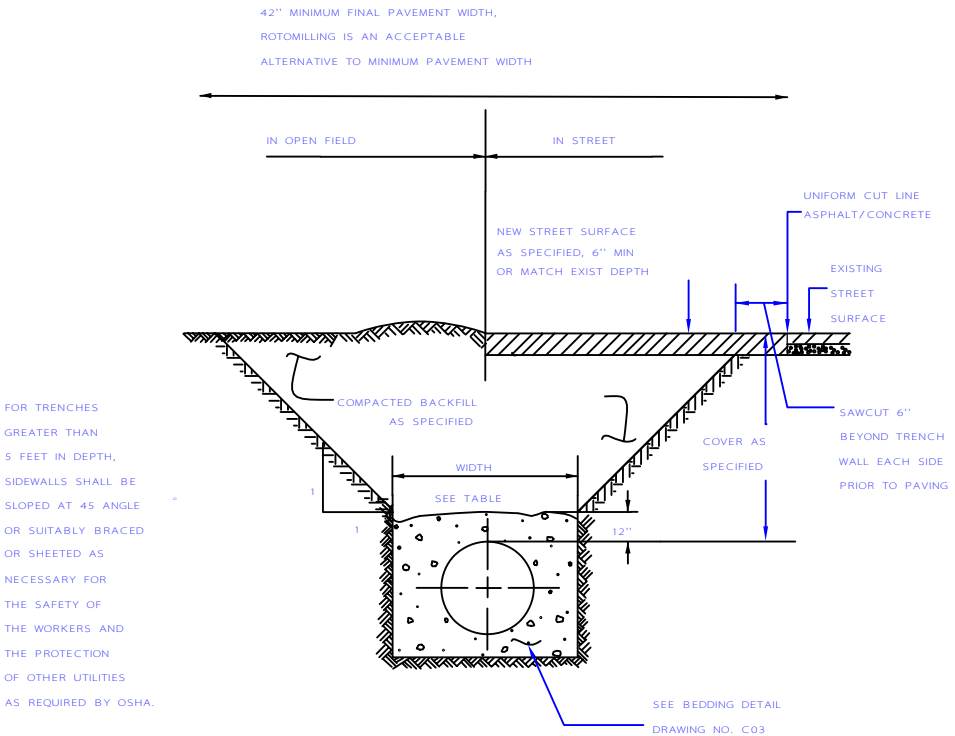
16'' OR LESS

ISSUED: JULY, 1999

REVISED:

DRAWING NO.

C.01



TYPICAL TRENCH SECTION

NOTES:

1. MINIMUM COVER TO BE BELOW OFFICIAL STREET GRADE.
2. MINIMUM DISTANCE BETWEEN EDGE OF TRENCH AND EDGE OF ASPHALT, OR LIP OF CURBLINE, SHALL BE 3 FEET.
3. REFER TO DRAWING NO. C.04 FOR PAVEMENT RESTORATION FOR PAVEMENT LESS THAN 3 YEARS OLD.
4. ON STATE HIGHWAYS, REFER TO CDOT UTILITY REQUIREMENTS.

TRENCH WIDTH

PIPE DIAMETER	MINIMUM WIDTH	MAXIMUM WIDTH
6''	1' - 6''	2' - 6''
8''	1' - 8''	2' - 8''
12''	2' - 0''	3' - 0''
16''	2' - 4''	3' - 4''
20''	2' - 8''	3' - 8''
24''	3' - 0''	4' - 0''

DRAWN BY:

CHECKED BY:

APPROVED BY:

University of Colorado

UTILITY TRENCH

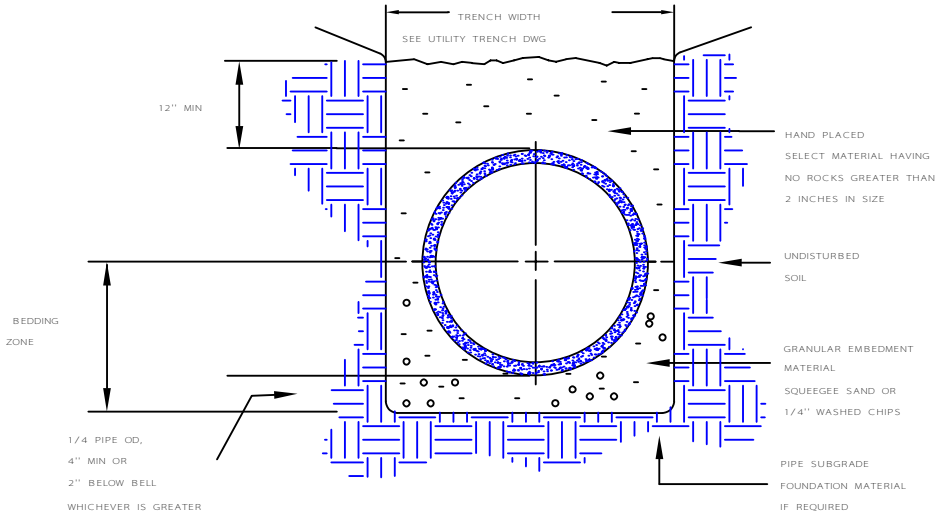
WIDER THAN 16''

ISSUED: JULY, 1999

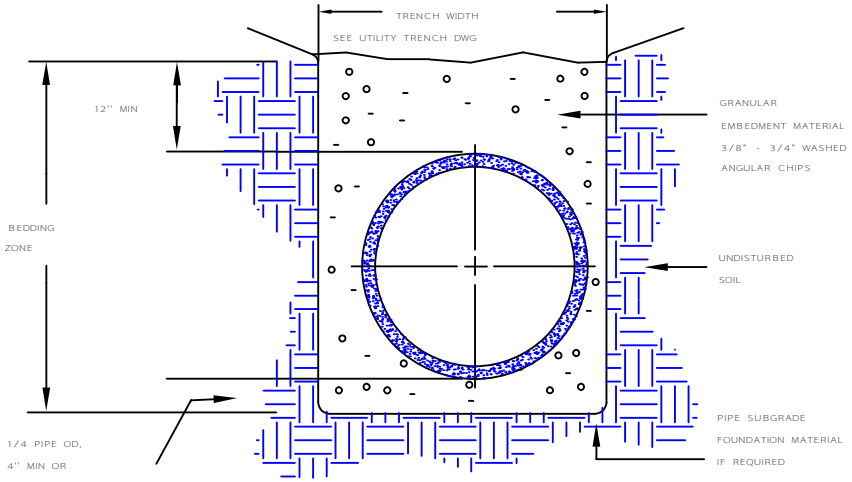
REVISED:

DRAWING NO.

C.02



ALLOWED WITH RCP



REQUIRED WITH ALL PIPE

EXCEPT RCP

(MAY BE USED WITH RCP AT CONTRACTOR'S OPTION)

DRAWN BY:

CHECKED BY:

APPROVED BY:

University of Colorado

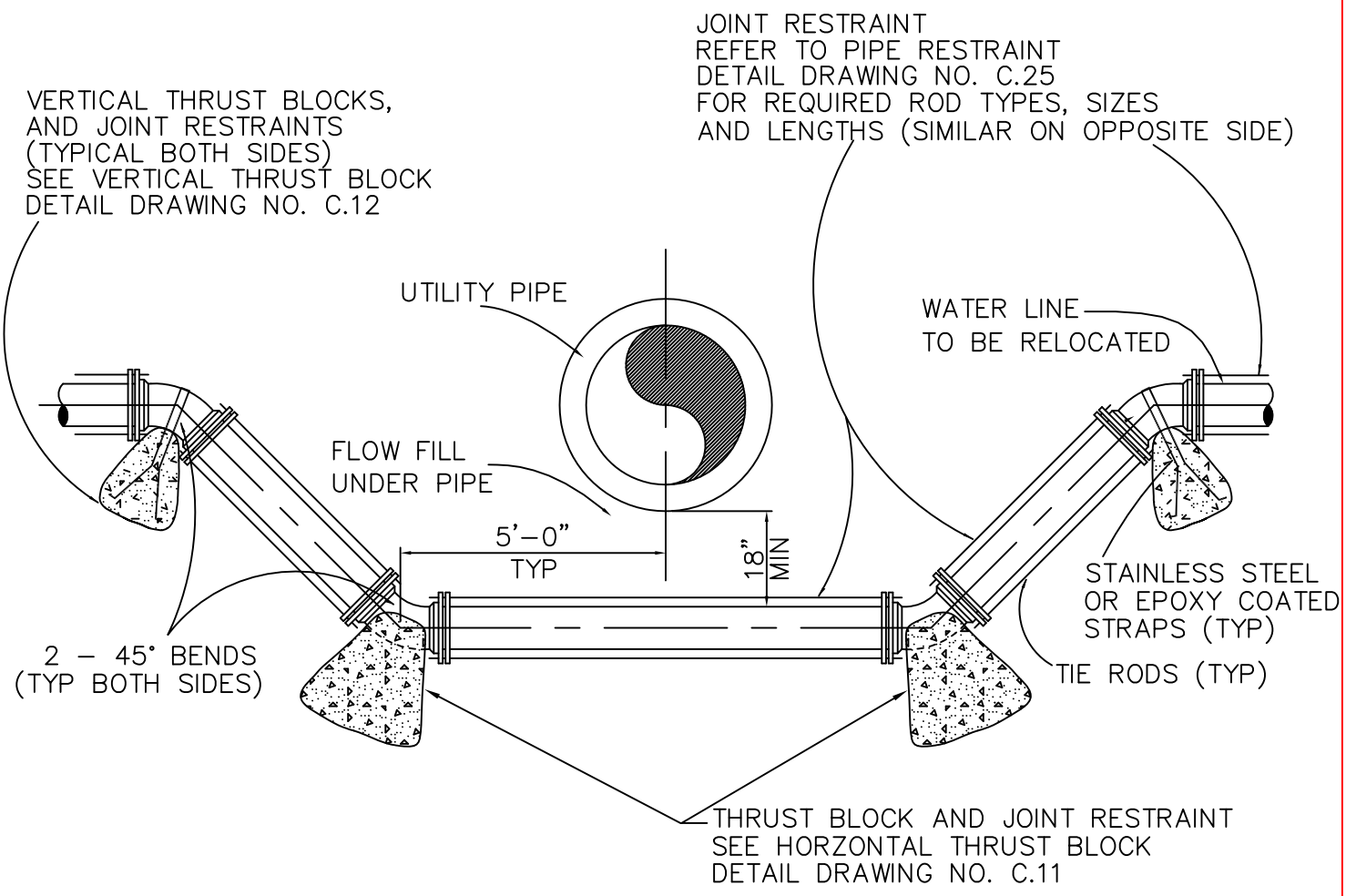
PIPE BEDDING

ISSUED: JULY, 1999

REVISED:

DRAWING NO.

C.03



NOTE: PIPE RESTRAINT SHALL
BE BOTH CONCRETE THRUST BLOCKS
AND JOINT RESTRAINT AS SPECIFIED

DRAWN BY: WMJ

CHECKED BY:

APPROVED BY:

University of Colorado

WATER LINE LOWERING

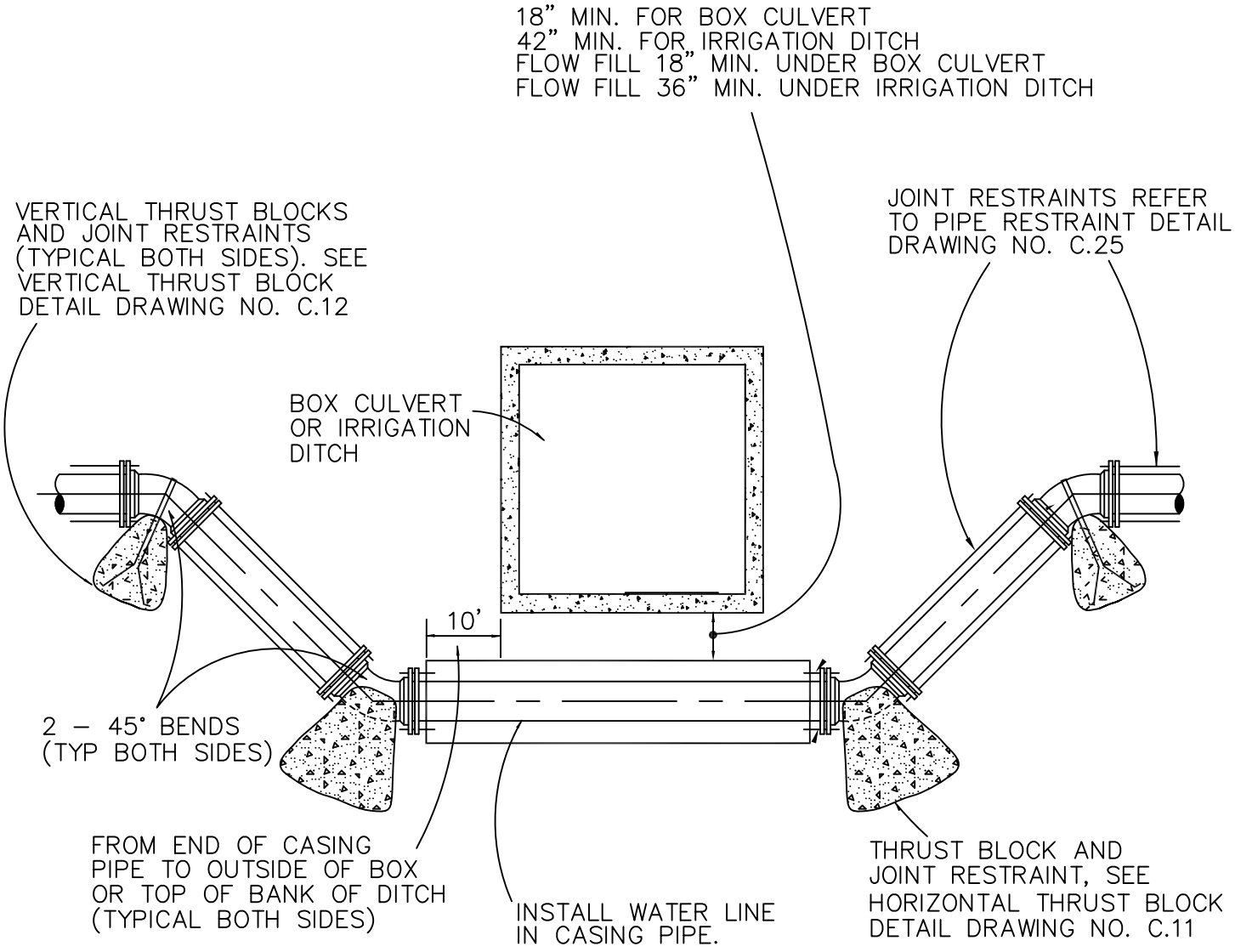
UTILITY LINE CROSSING ONLY

ISSUED: JULY, 1999

REVISED: JULY, 2014

DRAWING NO.

C.04



NOTE: PIPE RESTRAINT SHALL BE BOTH CONCRETE THRUST BLOCKS AND JOINT RESTRAINT AS SPECIFIED.

DRAWN BY: WMJ

CHECKED BY:

APPROVED BY:

University of Colorado

WATER LINE LOWERING

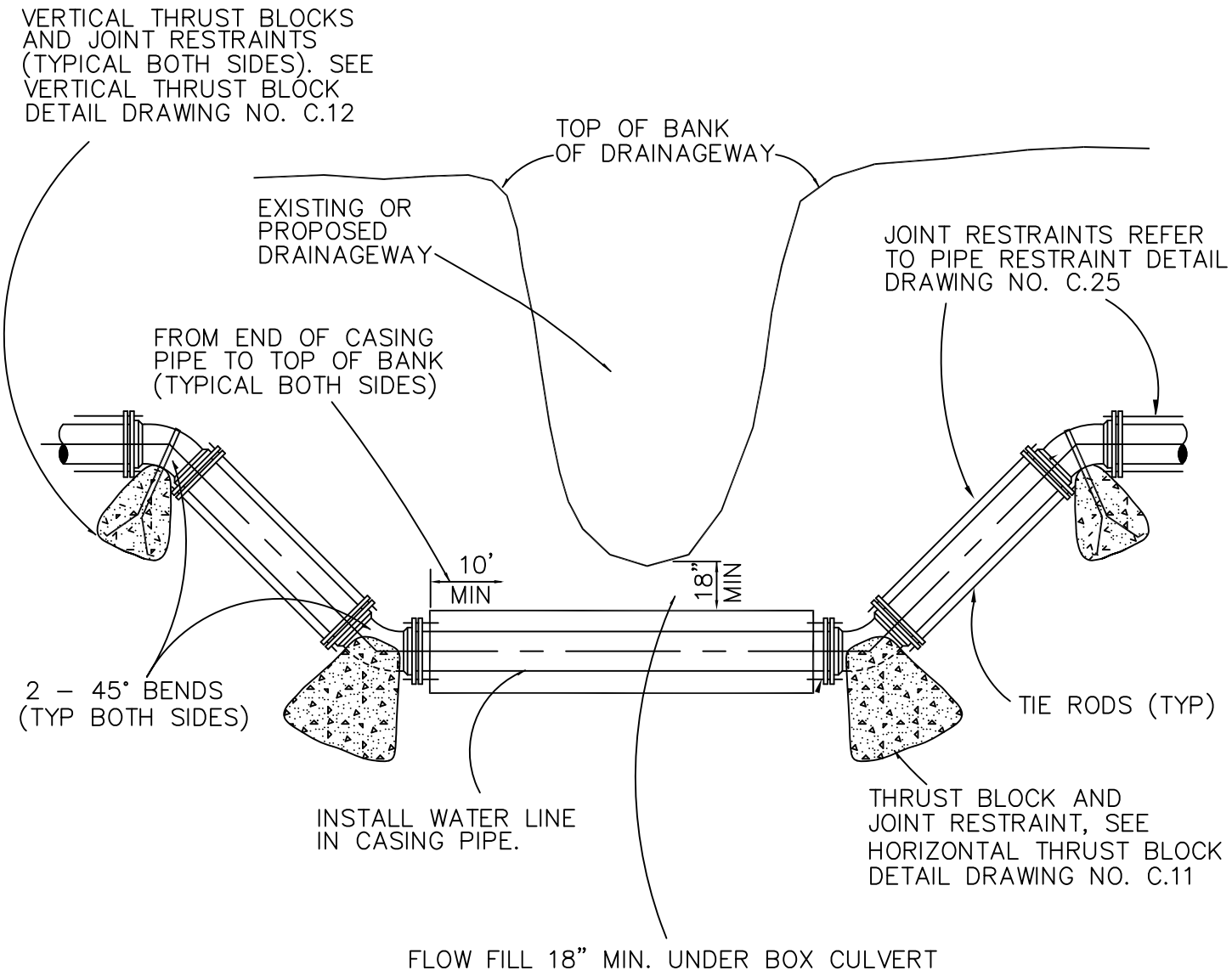
CULVERT CROSSING AND IRRIGATION DITCH CROSSING

ISSUED: JULY, 1999

REVISED: JULY, 2014

DRAWING NO.

C.05



NOTE: PIPE RESTRAINT SHALL BE BOTH CONCRETE THRUST BLOCKS AND JOINT RESTRAINT AS SPECIFIED.

DRAWN BY: WMJ

CHECKED BY:

APPROVED BY:

University of Colorado

WATER LINE LOWERING

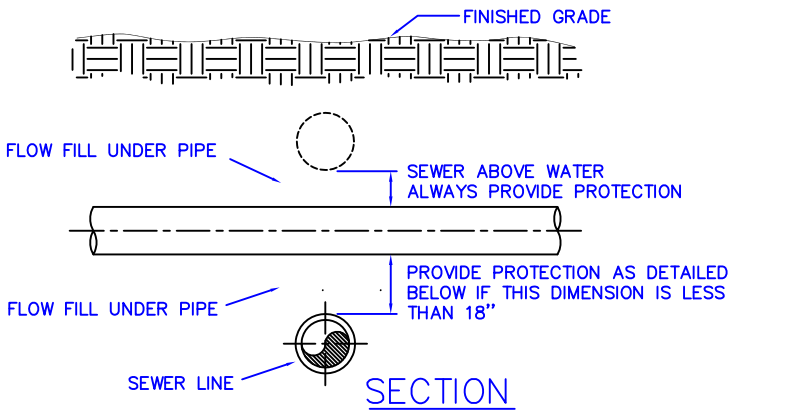
DRAINAGEWAY CROSSING ONLY

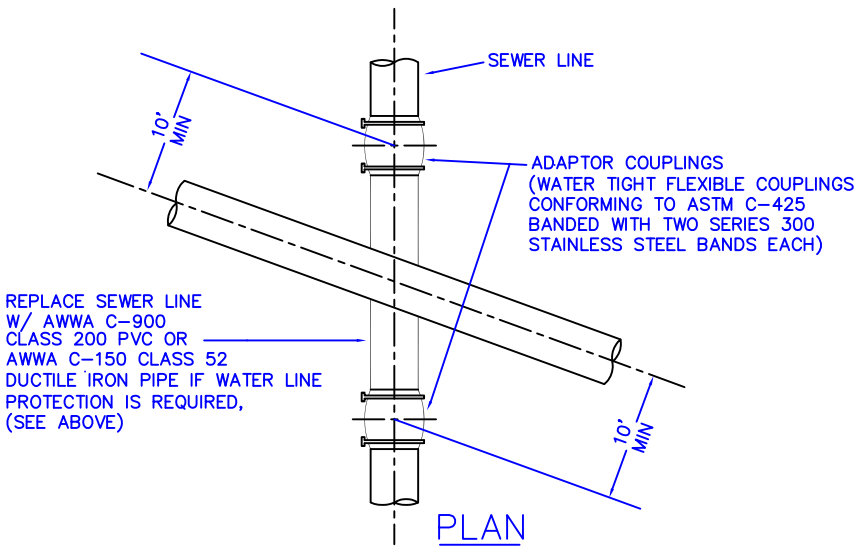
ISSUED: JULY, 1999

REVISED: JULY, 2014

DRAWING NO.

C.06





DRAWN BY:

CHECKED BY:

APPROVED BY:

University of Colorado

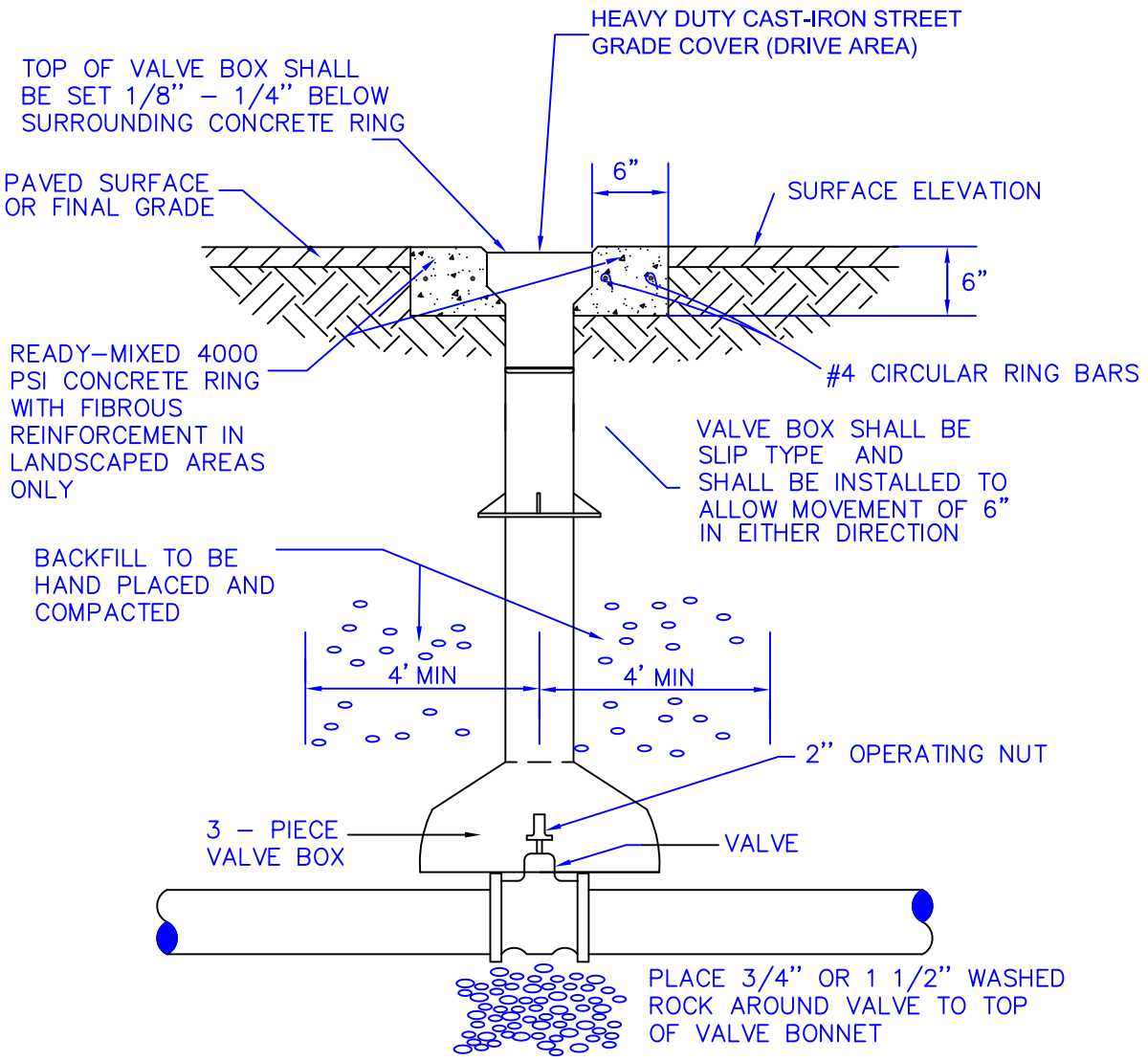
SEWER CROSSING

ISSUED: JULY, 1999

REVISED: MAY 2009

DRAWING NO.

C.07



NOTES:

1. OPERATING NUT SHALL BE EXTENDED WITHIN 4 FEET OF SURFACE.
2. EXTENSION STEMS REQUIRED WHERE VALVE IS AT DEPTH GREATER THAN 5 FEET.

DRAWN BY: SW

CHECKED BY:

APPROVED BY:

University of Colorado

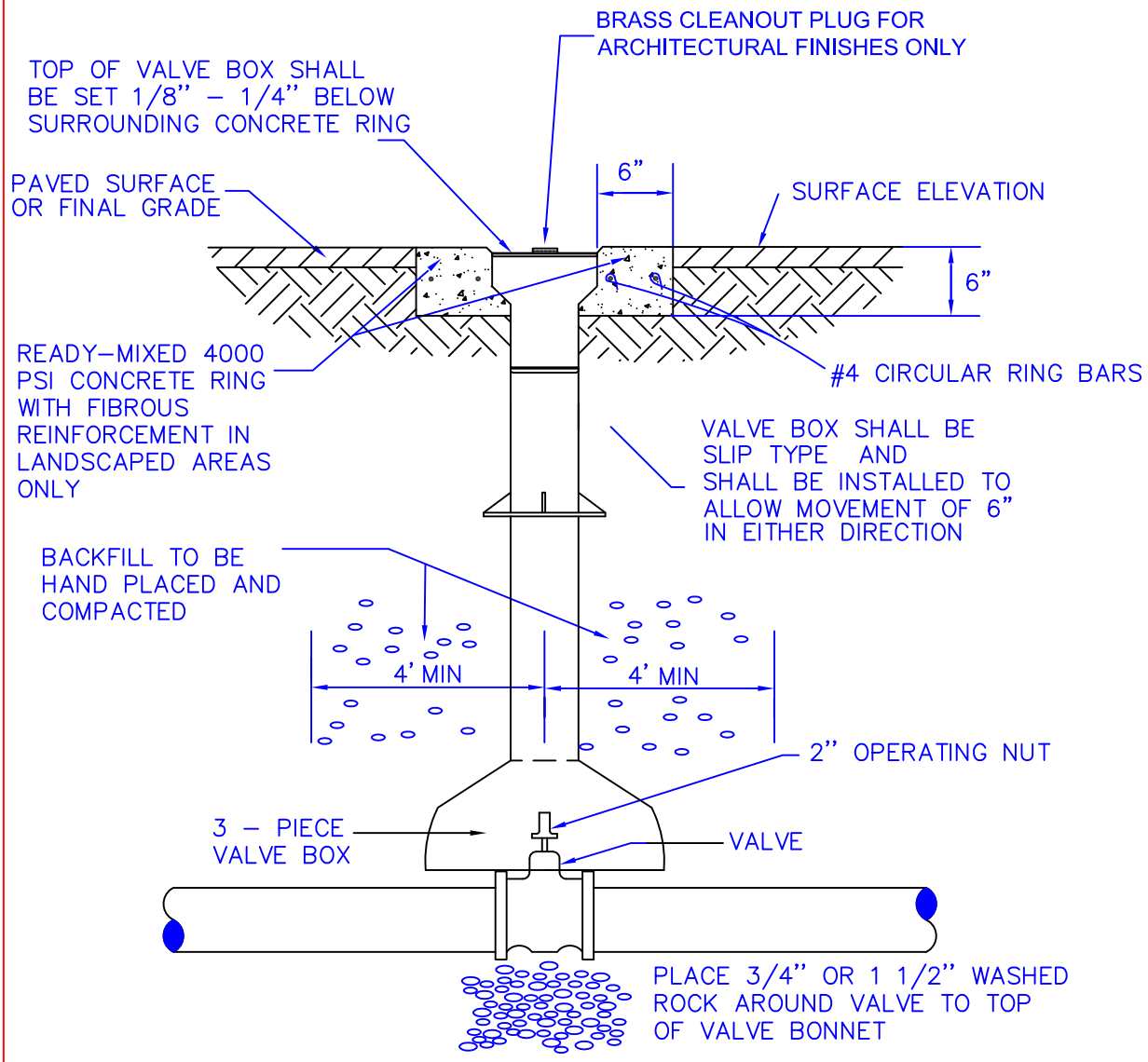
SEWER CLEANOUT VALVE BOX

ISSUED: JULY, 1999

REVISED: JUNE, 2014

DRAWING NO.

C.08a



NOTES:

1. OPERATING NUT SHALL BE EXTENDED WITHIN 4 FEET OF SURFACE.
2. EXTENSION STEMS REQUIRED WHERE VALVE IS AT DEPTH GREATER THAN 5 FEET.

DRAWN BY: SW

CHECKED BY:

APPROVED BY:

University of Colorado

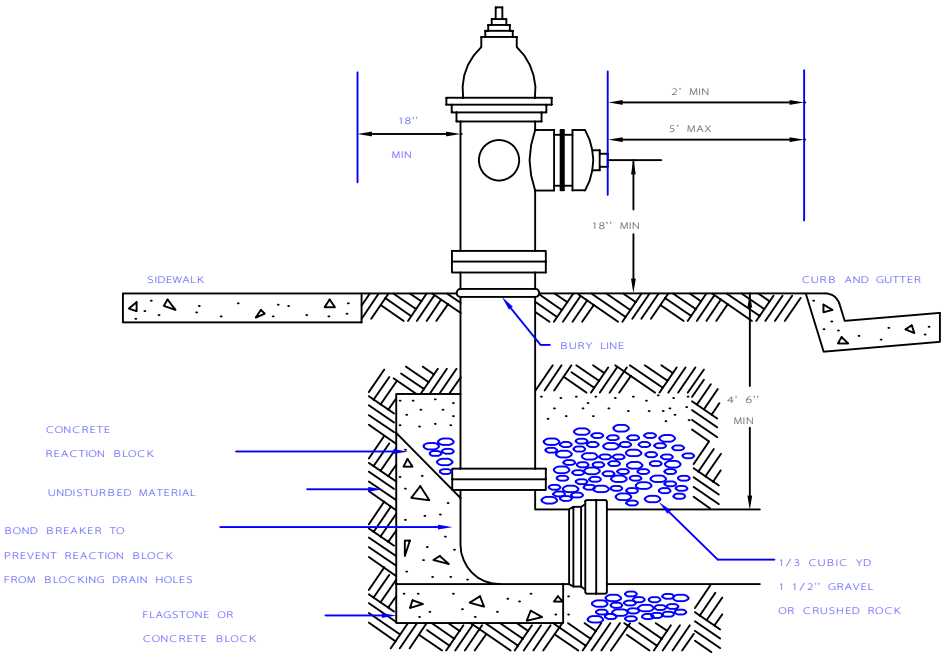
SEWER CLEANOUT VALVE BOX–ARCHITECTURAL FINISH

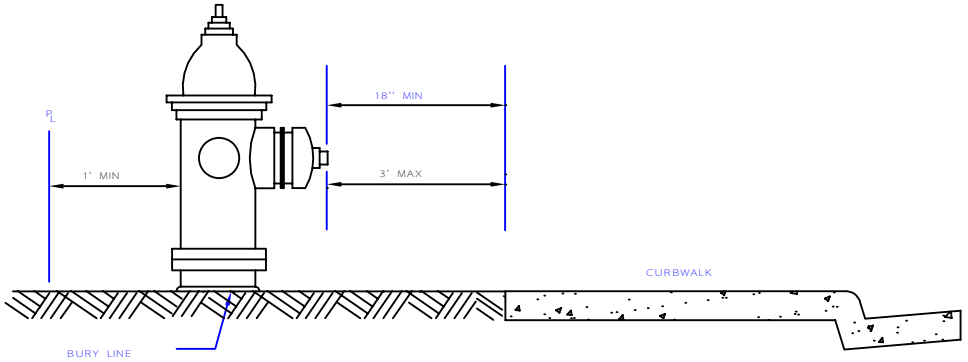
ISSUED: JULY, 1999

REVISED: JUNE, 2014

DRAWING NO.

C.08b





NOTE: FOR FIRE HYDRANT INSTALLATION, SEE DETAIL DRAWING NO. C.10.

DRAWN BY:

CHECKED BY:

APPROVED BY:

University of Colorado

FIRE HYDRANT PLACEMENT

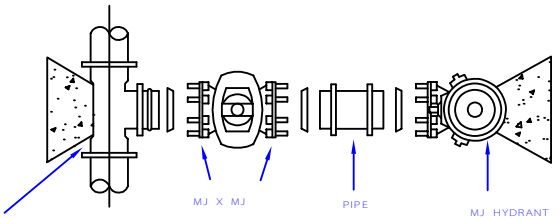
ISSUED: JULY, 1999

REVISED:

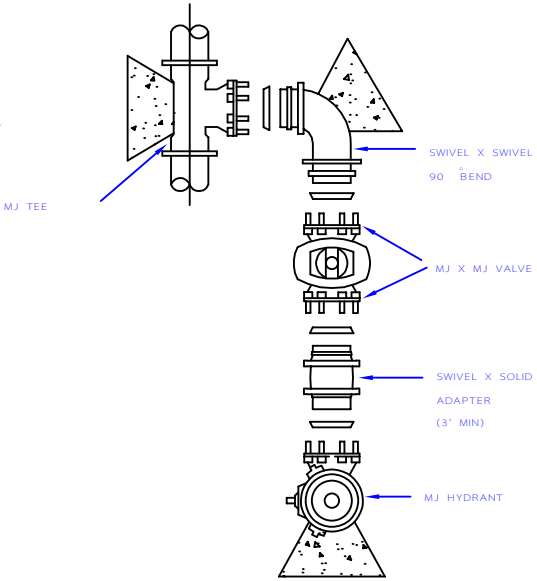
DRAWING NO.

C.09

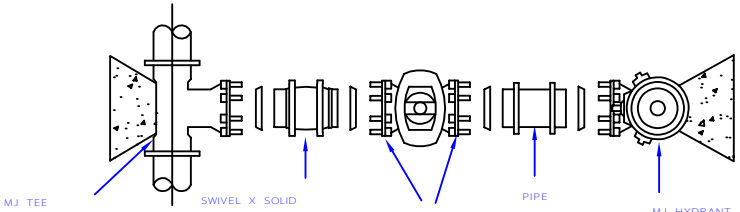
TYPE 1



TYPE 2



TYPE 3



DRAWN BY:

CHECKED BY:

APPROVED BY:

University of Colorado

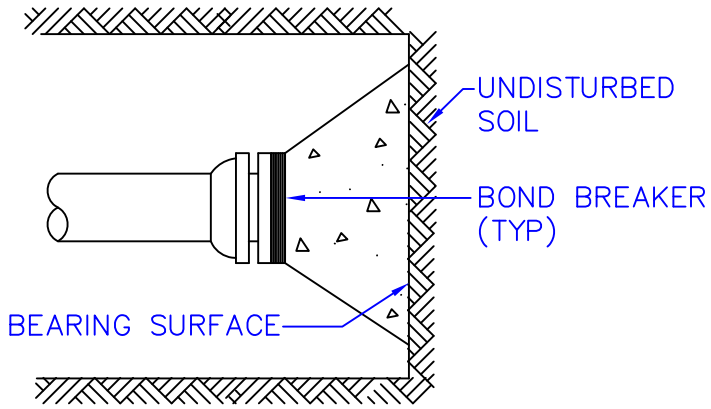
FIRE HYDRANT INSTALLATION TYPES 1, 2 AND 3

ISSUED: JULY, 1999

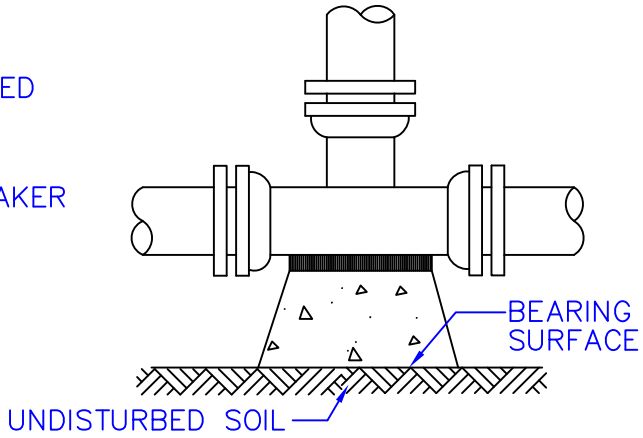
REVISED:

DRAWING NO.

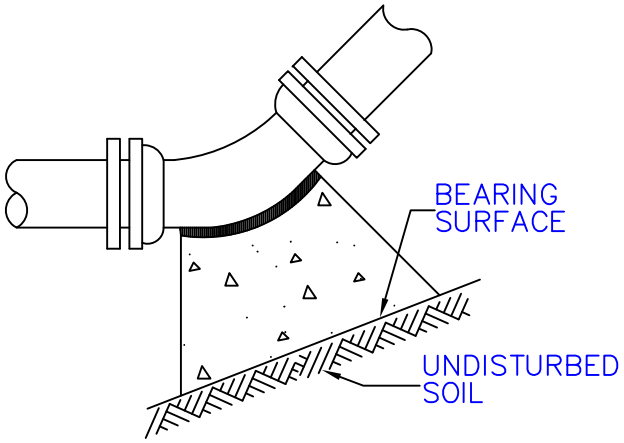
C.10



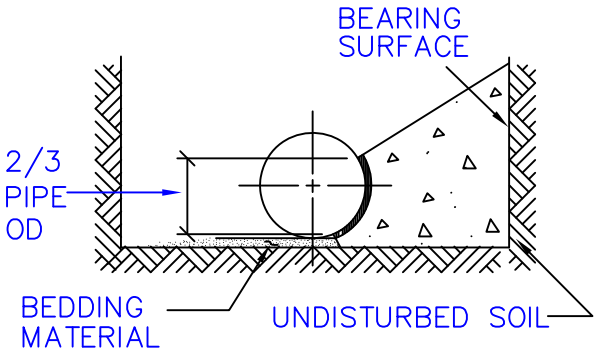
DEAD END



TEE



11 1/4°, 22 1/2°, 45° AND 90° BENDS



TYPICAL CROSS SECTION

MINIMUM BEARING SURFACE AREA IN SQUARE FEET

SIZE	TEE AND PLUG	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND
4"	2.0	2.5	1.5	1.0	1.0
6"	4.0	5.5	3.0	1.5	1.0
8"	6.5	9.0	5.0	2.5	1.5
10"	10.0	14.0	7.5	4.0	2.0
12"	14.0	20.0	11.0	5.5	3.0
14"	19.0	27.0	14.5	7.5	4.0
16"	25.0	35.0	19.0	10.0	5.0
18"	31.5	44.5	24.0	12.5	6.5
20"	38.0	54.5	29.5	15.0	7.5
24"	55.5	78.5	42.5	22.0	11.0

NOTES:

1. BASED ON 250 PSI MAXIMUM PRESSURE AND 2000 LBS/FT² BEARING CAPACITY.
2. ALL FITTINGS MUST BE WRAPPED WITH POLYETHYLENE TO PREVENT CONCRETE FROM ADHERING TO BOLTS OR PIPES.
3. MAXIMUM JOINT DEFLECTION WITHOUT REACTION BLOCK IS 1+1/2°.
4. CONCRETE SHALL DEVELOP 3,000 PSI AT 28 DAYS.
5. JOINTS AND BOLTS SHALL BE ACCESSIBLE FOR REPAIRS.
6. ALTERNATVE THRUST BLOCK DESIGNS, BASED ON LOCAL SOIL CONDITIONS AS ASSESSED BY A LICENSED GEOTECHNICAL ENGINEER, WILL BE ALLOWED WITH WRITTEN APPROVAL FROM THE UCB CIVIL ENGINEER.

DRAWN BY:

CHECKED BY:

APPROVED BY:

University of Colorado

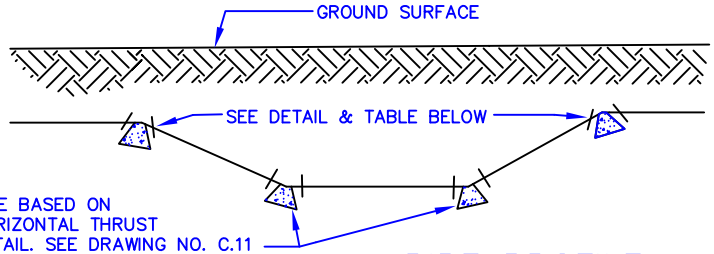
HORIZONTAL THRUST BLOCK

ISSUED: JULY, 1999

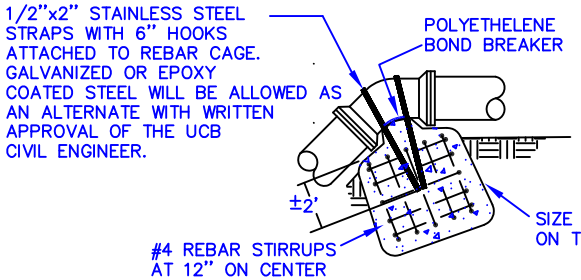
REVISED: JULY, 2014

DRAWING NO.

C.11



PIPE PROFILE



DETAIL

NOTES:

1. ALL FITTINGS MUST BE WRAPPED WITH POLYETHYLENE TO PREVENT CONCRETE FROM ADHERING TO BOLTS OR PIPE.
2. ALTERNATVE THRUST BLOCK DESIGNS, BASED ON LOCAL SOIL CONDITIONS AS ASSESSED BY A LICENCED GEOTECHNICAL ENGINEER, WILL BE ALLOWED WITH WRITTEN APPROVAL FROM THE UCB CIVIL ENGINEER.

REQUIRED CUBIC YARDS OF CONCRETE *

SIZE	11 1/4° BEND	22 1/2° BEND	45° BEND
4"	0.2	0.3	0.9
6"	0.4	0.7	2.1
8"	0.6	1.3	3.6
10"	1.0	1.9	5.6
12"	1.4	2.7	8.1
14"	1.9	3.8	11.1
16"	2.4	4.9	14.4
18"	3.1	6.2	18.3
20"	3.8	7.6	22.6
24"	5.5	10.7	32.5

* BASED ON 250 PSI MAXIMUM PRESSURE WITH NO SOIL BEARING PRESSURE

DRAWN BY:

CHECKED BY:

APPROVED BY:

University of Colorado

VERTICAL THRUST BLOCK

ISSUED: JULY, 1999

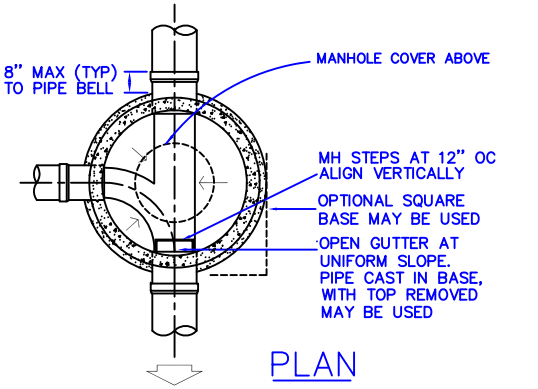
REVISED: JULY, 2014

DRAWING NO.

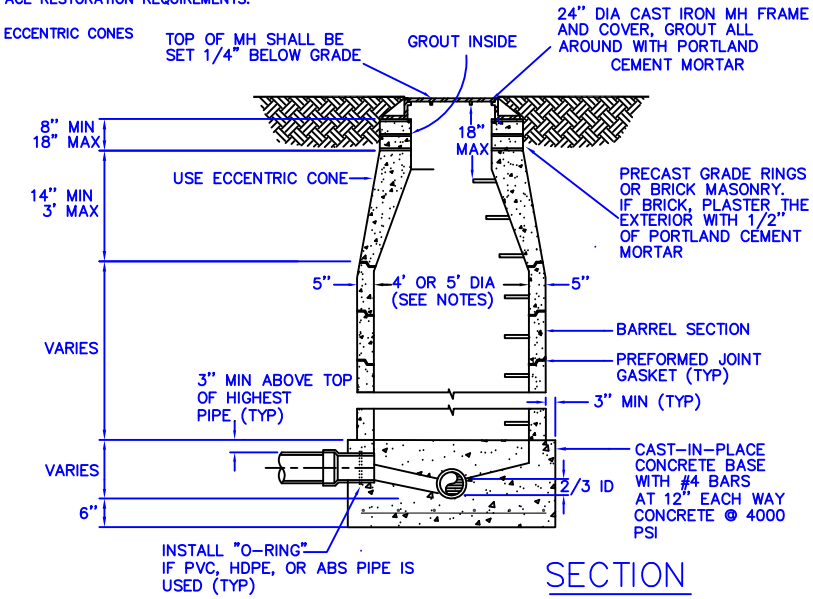
C.12

NOTES:

1. 4' MANHOLES SHALL BE USED FOR PIPES UP TO 24" DIAMETER.
2. 5' MANHOLES SHALL BE USED FOR PIPES FROM 27"–36" DIAMETER.
3. SPECIAL MANHOLES SHALL BE USED FOR PIPES LARGER THAN 36" DIAMETER.
4. MANHOLES LESS THAN OR EQUAL TO 6' FROM TOP OF CASTING TO INVERT SHALL HAVE FLAT TOPS WITH CONCENTRIC OPENING. ALL ADJUSTING RINGS, CASTINGS, INVERTS, BOTTOMS, ETC., SHALL BE SIMILAR TO SHOWN MANHOLE.
5. REFER TO SPECIFICATIONS FOR MATERIAL, INSTALLATION, TESTING, BACKFILL AND SURFACE RESTORATION REQUIREMENTS.
6. USE ECCENTRIC CONES



PLAN



SECTION

DRAWN BY:

CHECKED BY:

APPROVED BY:

University of Colorado

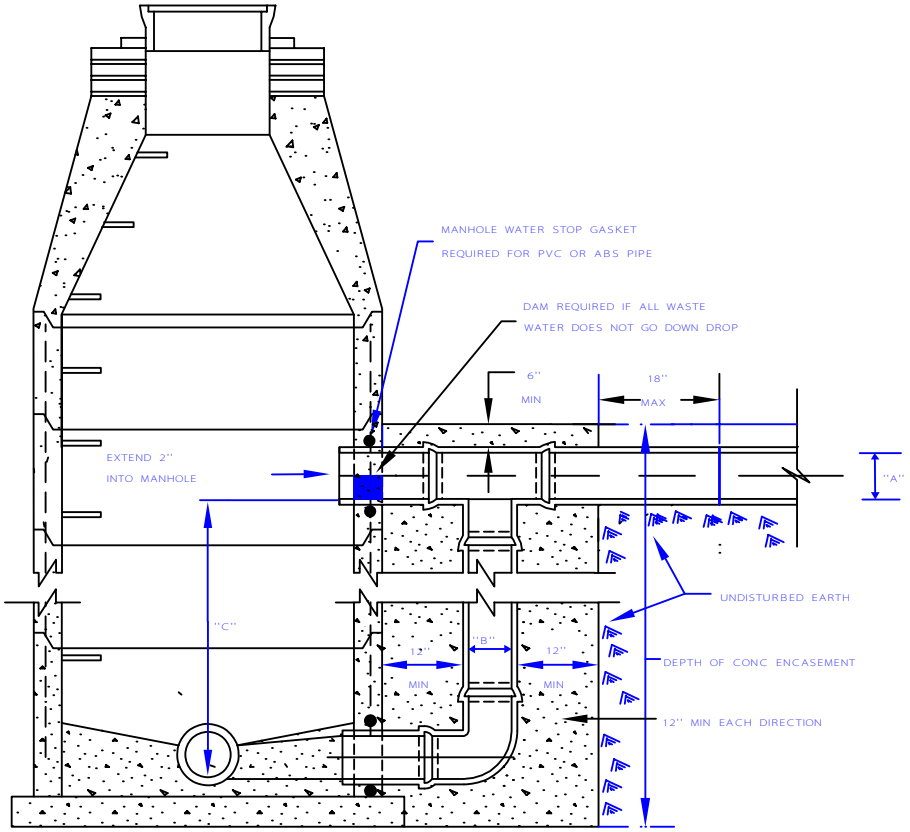
STANDARD SEWER MANHOLE

ISSUED: JULY, 2008

REVISED: MAY 2009

DRAWING NO.

C.13



"A" PIPE DIA	"B" PIPE DIA
8"	8"
10"	10"
12"	12"
15"	12"
18"	15"
21"	18"
24"	18"
27"	18"
30"	18"
36"	18"
42"	24"
48"	30"

NOTES:

1. DROP MANHOLES ARE REQUIRED WHEN "C" > 2 FEET.
2. SEE STANDARD SEWER MANHOLE DETAIL DRAWING NO. C.21.

DRAWN BY:

CHECKED BY:

APPROVED BY:

University of Colorado

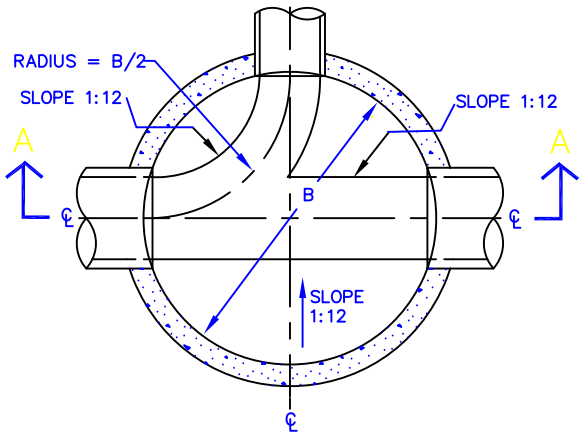
STANDARD DROP SEWER MANHOLE

ISSUED: JULY, 1999

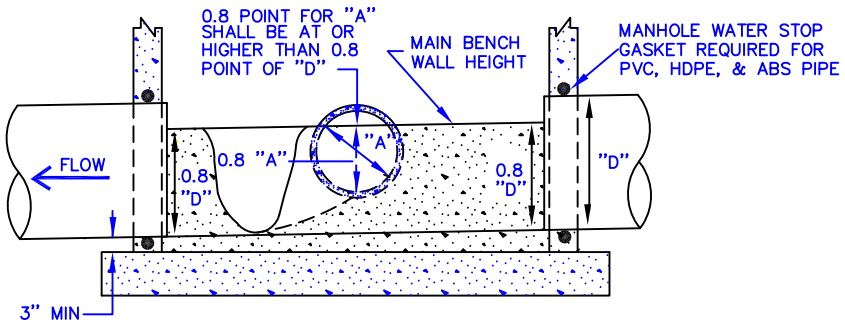
REVISED:

DRAWING NO.

C.14

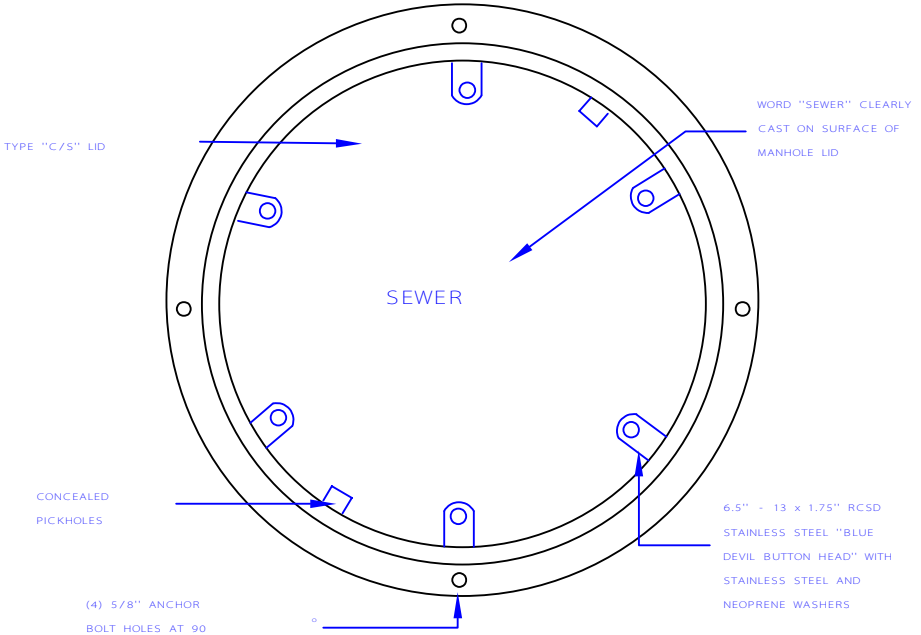


PLAN

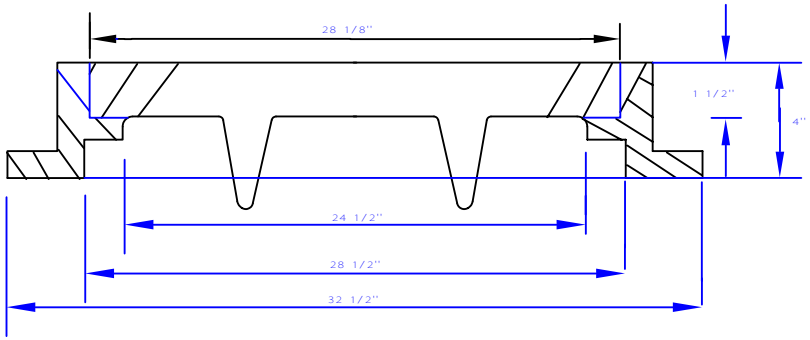


SECTION A–A

DRAWN BY: CHECKED BY: APPROVED BY:	University of Colorado MANHOLE INVERT	ISSUED: JULY, 1999 REVISED: MAY 2009 DRAWING NO. C.15



NOTE: STANDARD FRAME AND COVER FOR MANHOLE LOCATED OUTSIDE DEDICATED STREET ROW AND WHERE SURFACE RUNOFF CANNOT BE AVOIDED.



NEENAH PRESSURE TYPE ROUND MH FRAME, C/S BOLTED LID R-6462-GH OR APPROVED EQUAL (SUBMIT TO CITY FOR APPROVAL)

DRAWN BY:

CHECKED BY:

APPROVED BY:

University of Colorado

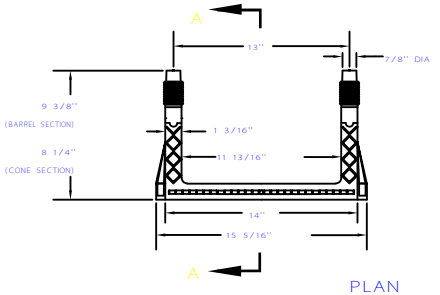
STANDARD MANHOLE BOLT-DOWN WATER-TIGHT FRAME AND COVER

ISSUED: JULY, 1999

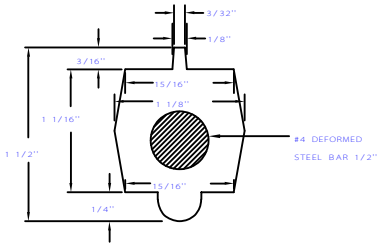
REVISED:

DRAWING NO.

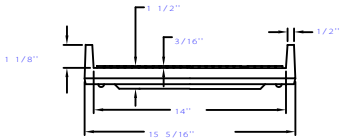
C.16



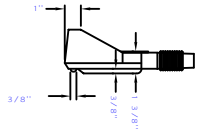
PLAN



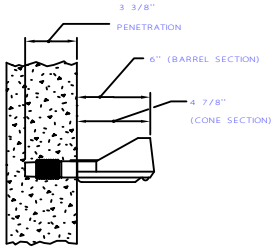
SECTION A - A



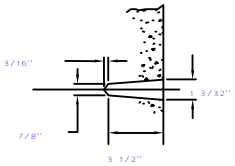
ELEVATION



END VIEW



DETAILS



PIN BLOCK OUT

NOTES:

1. STEPS TO BE CAST, UNALTERED, IN MANHOLE WALL IN A STRAIGHT LINE, VERTICALLY. AT SAME TIME THE BARREL OR CONE SECTIONS ARE CAST.

2. IF STEPS ARE NOT CAST INTO THE MANHOLE BARREL SECTIONS AS MENTIONED ABOVE. STEPS SHALL BE INSTALLED BY THE "PRESS FIT" METHOD, UTILIZING A SPECIALLY TAPERED PIN TO FORM THE INSERT HOLE AS SHOWN. FOLLOWING MANUFACTURES RECOMMENDED PROCEDURE AND SHALL NOT BE GROUTED IN PLACE.

3. INSTALLED STEPS SHALL BE CAPABLE OF WITHSTANDING A PULL OUT FORCE OF 2500 LBS. PER LEG FOR A MINIMUM PERIOD OF TWO MINUTES.

4. PINS MUST BE SMOOTH AND CONTINOUSLY TAPERED. DIMENSIONS OF THE PIN AND THE INSERTED PORTION OF THE MANHOLE STEP ARE TYPICAL ONLY. W.M.D. INSTALLATIONS REQUIRE A MATCHED COMBINATION OF A TAPPERED INSERT PIN AND MANHOLE STEP, AS RECOMMENDED OR REQUIRED BY SPECIFIC MANUFACTURER OF THE STEP TO BE USED.

5. THIS STEP CAN ALSO BE USED IN TOE POCKET INSTALLATIONS PROVIDED 5" TOE CLEARANCE IS ALLOWED.

DRAWN BY:

CHECKED BY:

APPROVED BY:

University of Colorado

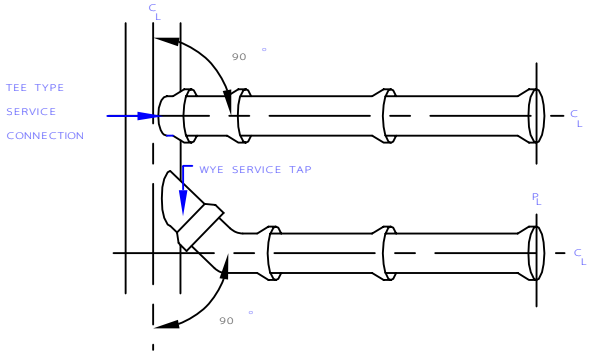
POLYPROPYLENE REINFORCED PLASTIC MANHOLE STEP

ISSUED: JULY, 1999

REVISED:

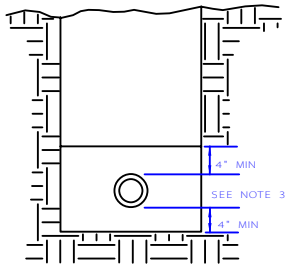
DRAWING NO.

C.17

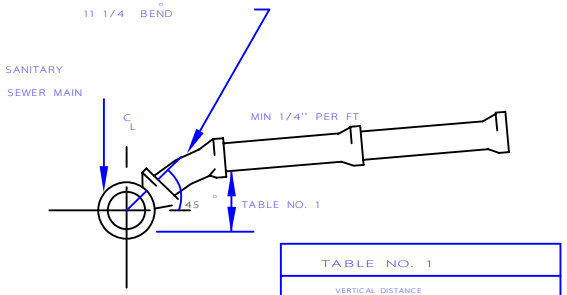


PLAN

MINIMUM TRENCH WIDTH SHALL BE
THE DIAMETER OF THE PIPE PLUS 8"



CROSS SECTION

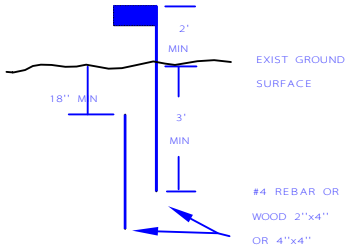


PROFILE

TABLE NO. 1

VERTICAL DISTANCE FROM FLOWLINE OF MAIN TO FLOWLINE OF SERVICE LINE		
MAIN SIZE	4" SERVICE	6" SERVICE
8"	6"	10"
10"	11"	12"
12"	12"	13"
15"	15"	16.5"

GREEN FLAGGING OR PAINTED GREEN



MARKER POST

(AT SERVICE STUB OUT)

NOTES:

1. ALL SERVICE LINES SHALL BE 4" MINIMUM IN DIAMETER.
2. THE MINIMUM SLOPE FOR 4" OR 6" SERVICE LINES SHALL BE 1\4" PER FOOT.
3. BEDDING FOR HOUSE CONNECTION WITHIN CITY ROW SHALL BE THE SAME AS FOR SEWER MAIN, LAID TO A MINIMUM DEPTH OF 4" BELOW THE PIPE INVERT AND 4" ABOVE THE TOP OF THE PIPE.
4. ALL TAPS ARE TO BE MADE BY THE CITY OF BOULDER, UNLESS OTHERWISE AUTHORIZED BY THE UTILITY DIVISION.
5. SERVICE LINES LARGER THAN 6" MUST BE CONNECTED TO THE MAIN AT A MANHOLE.
6. SERVICE LINE WILL BE PLUGGED AT THE PROPERTY LINE WITH APPROPRIATE PLUG FOR TYPE OF LINE INSTALLED UNTIL CONNECTED TO BUILDING. AFTER ABANDONMENT OF A SERVICE LINE IT MUST BE PLUGGED 5' INSIDE THE PROPERTY. LINE.
7. COMPACTION OF BACKFILL SHALL BE AS STATED IN THE CITY OF BOULDER, STANDARD SPECIFICATIONS.

DRAWN BY:

CHECKED BY:

APPROVED BY:

University of Colorado

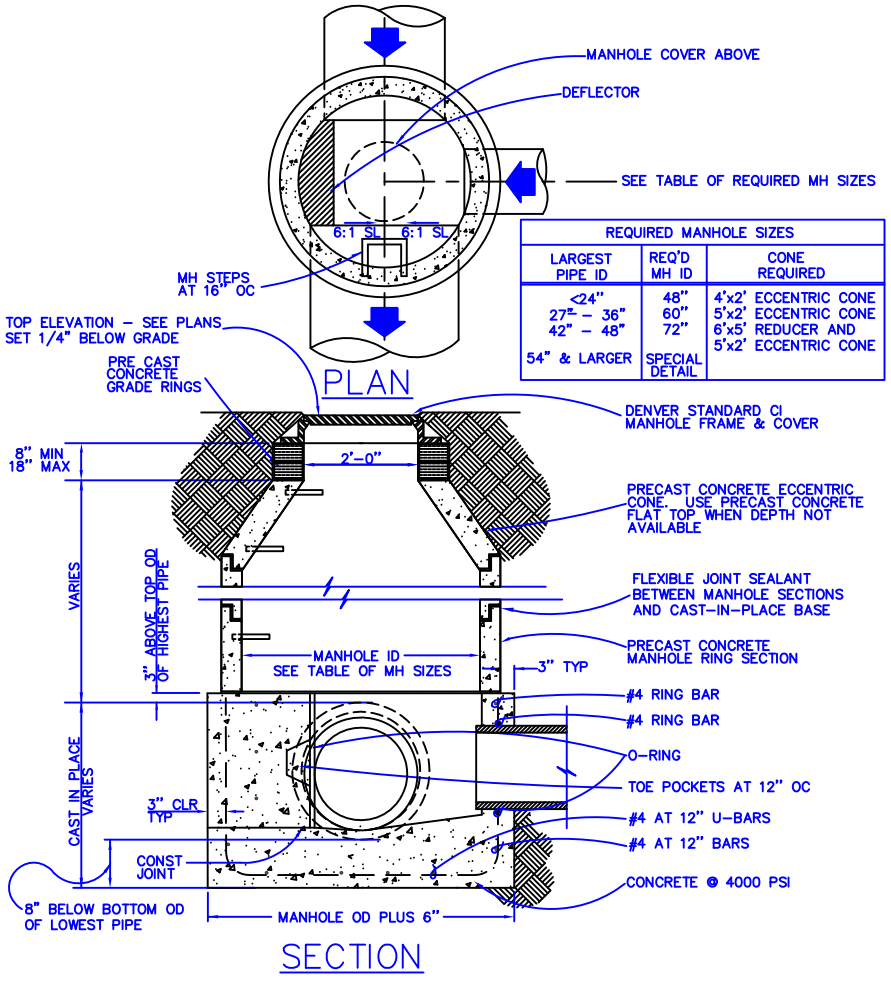
SEWER SERVICE LINE

ISSUED: JULY, 1999

REVISED:

DRAWING NO.

C.18



REQUIRED MANHOLE SIZES		
LARGEST PIPE ID	REQ'D MH ID	CONE REQUIRED
<24"	48"	4'x2' ECCENTRIC CONE
27"– 36"	60"	5'x2' ECCENTRIC CONE
42" – 48"	72"	6'x5' REDUCER AND 5'x2' ECCENTRIC CONE
54" & LARGER	SPECIAL DETAIL	

DRAWN BY:

CHECKED BY:

APPROVED BY:

University of Colorado

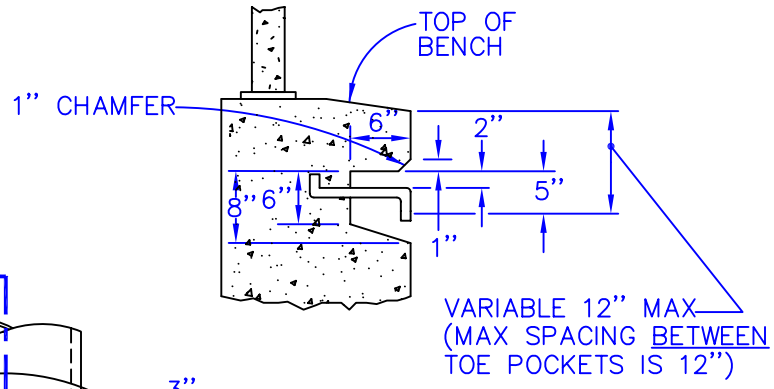
STORM SEWER MANHOLE

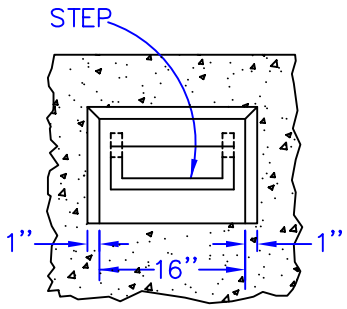
ISSUED: JULY, 2008

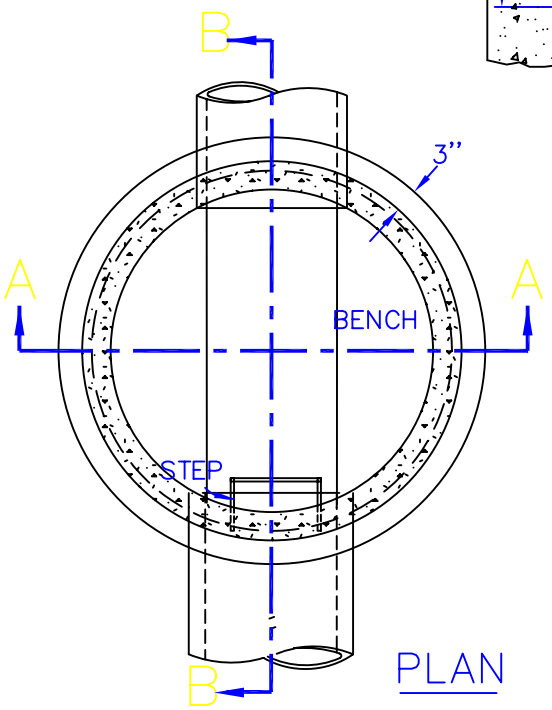
REVISED: MAY 2009

DRAWING NO.

C.19





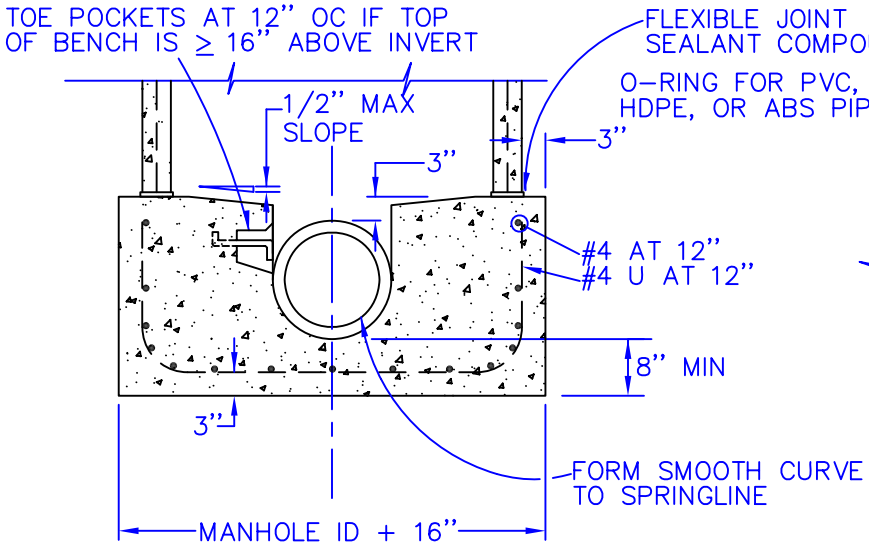


PLAN

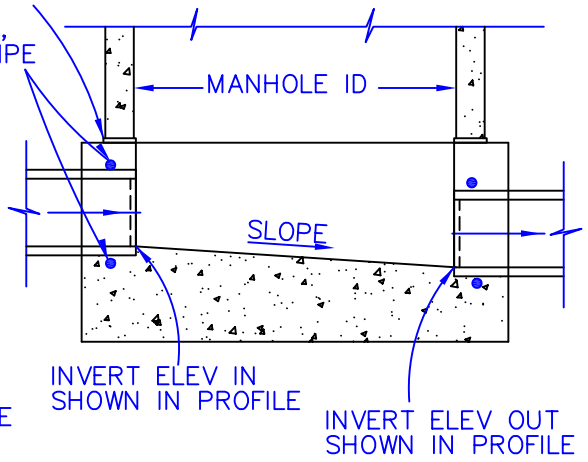
TOE POCKET DETAILS

NOTES:

1. SHAPING FOR SMOOTH MANHOLE INVERTS MAY BE DONE BY FORMING OR SHAPING WITH CEMEMT MORTAR.
2. THE MANHOLE STEPS SHALL BE POLYPROPYLENE, SEE DETAIL DRAWING NO. C.17.
3. PRECAST SECTION TO CONFORM TO ASTM C-478.
4. STUB OUTS SHALL EXTEND 2 FEET MINIMUM PAST MANHOLE OUTSIDE DIAMETER AND BE SATISFACTORILY PLUGGED.
5. MANHOLE BASE SHALL BE CONSTRUCTED USING 4000 PSI CONCRETE



SECTION A-A



SECTION B-B

DRAWN BY:

CHECKED BY:

APPROVED BY:

University of Colorado

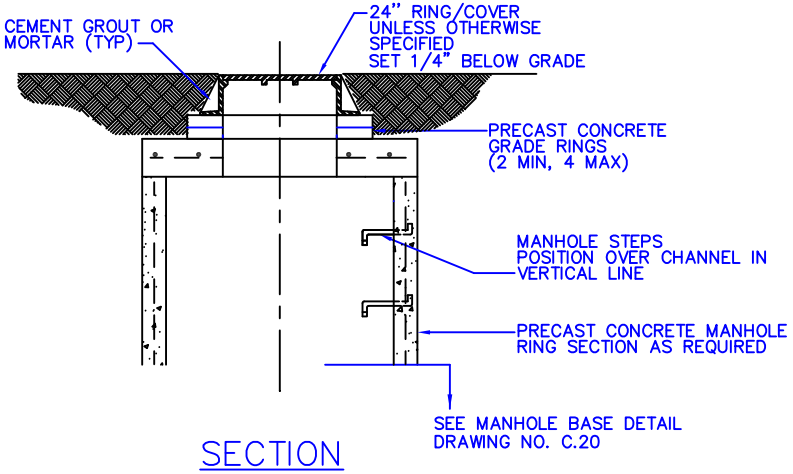
STORM SEWER MANHOLE BASE

ISSUED: JULY, 1999

REVISED: MAY 2009

DRAWING NO.

C.20



SECTION

NOTES:

1. PRECAST SECTIONS TO CONFORM TO ASTM C-478.
2. RING/COVER TO BE SET ON FULL BED OF MORTAR.

DRAWN BY:

CHECKED BY:

APPROVED BY:

University of Colorado

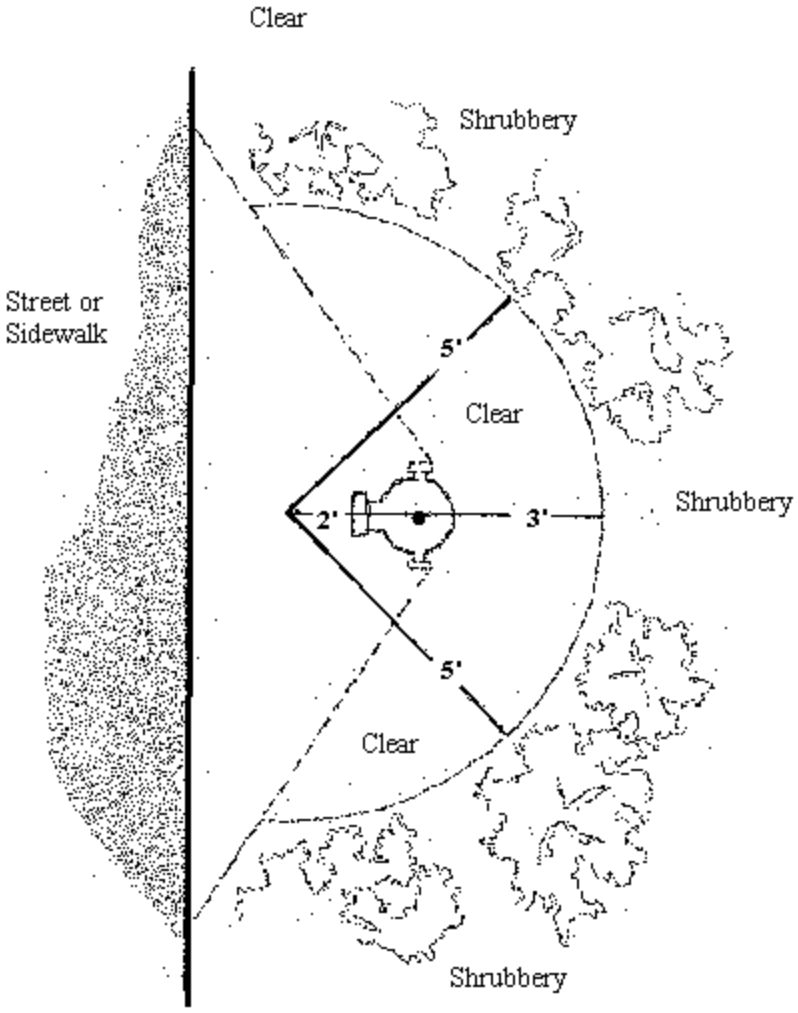
FLAT TOP FOR FOR SHALLOW MANHOLES LESS THAN 6' IN HEIGHT

ISSUED: JULY, 2008

REVISED: _____

DRAWING NO.

C.21



drawn by

checked by

approved by

University of Colorado

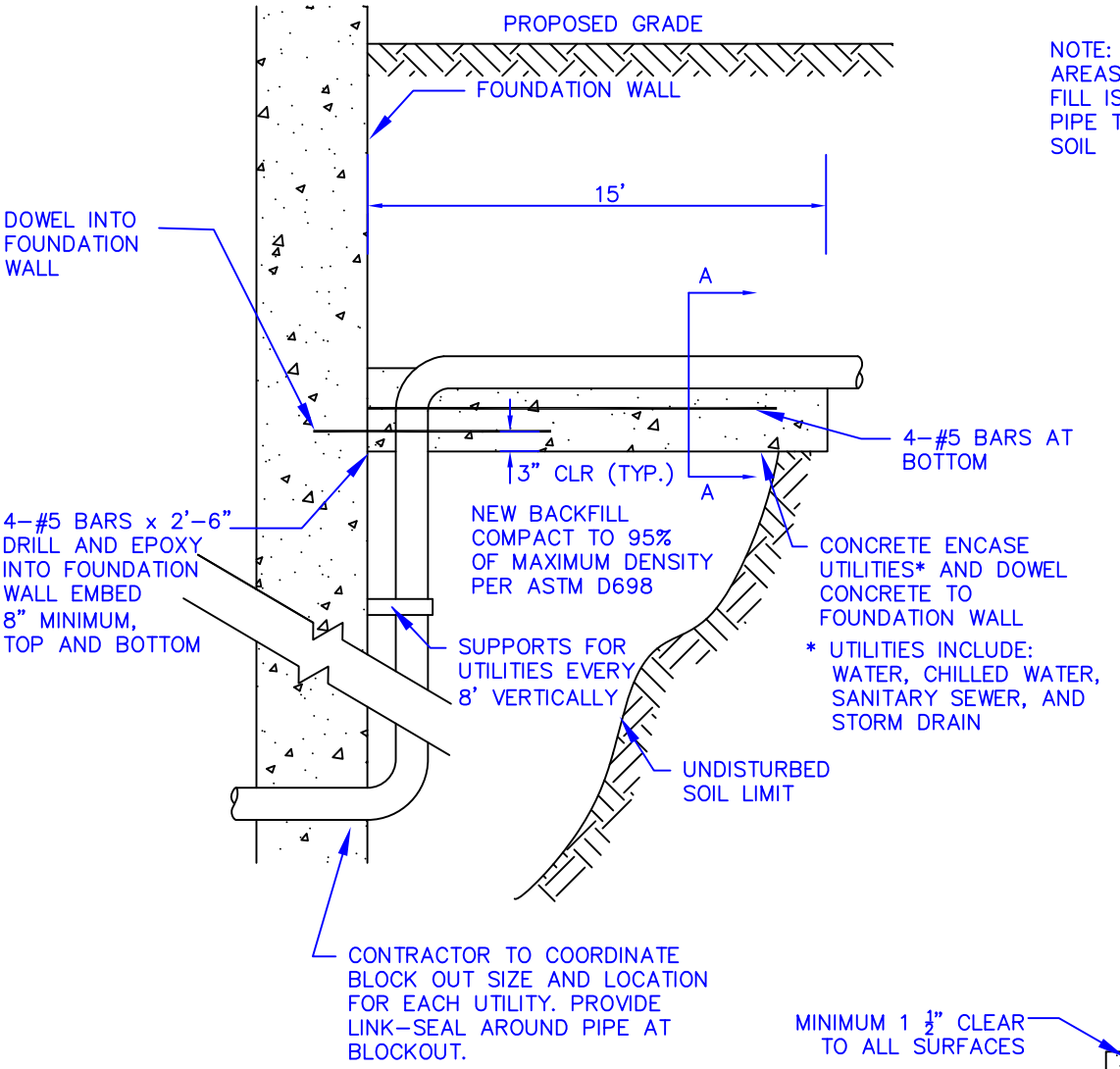
Fire Hydrant Landscape Setback Minimums

Issued June 2002

revised _____

DRAWING NO.

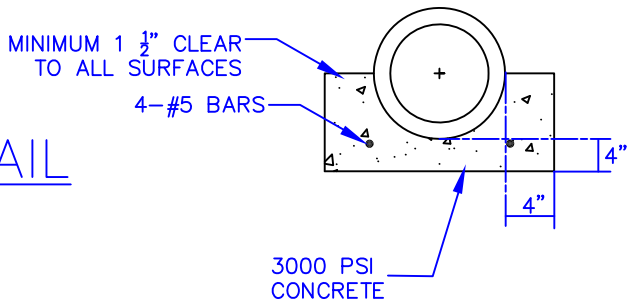
C.22



NOTE: TO BE USED IN AREAS WHERE FLOW FILL IS UNDER UTILITY PIPE TO UNDISTURBED SOIL

UTILITY BRIDGING DETAIL

N.T.S.



SECTION A–A

N.T.S.

DRAWN BY: WMJ

CHECKED BY:

APPROVED BY:

University of Colorado

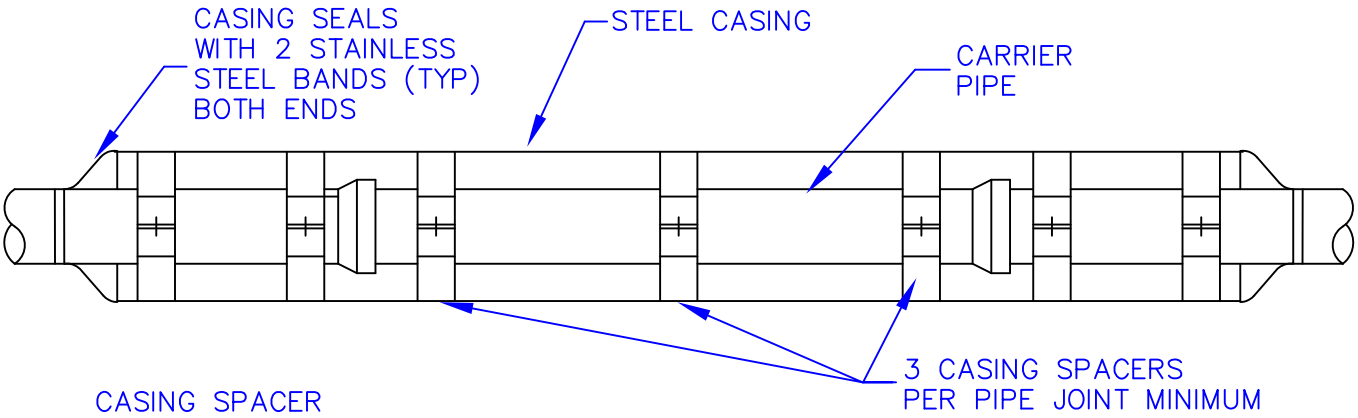
UTILITY BRIDGING

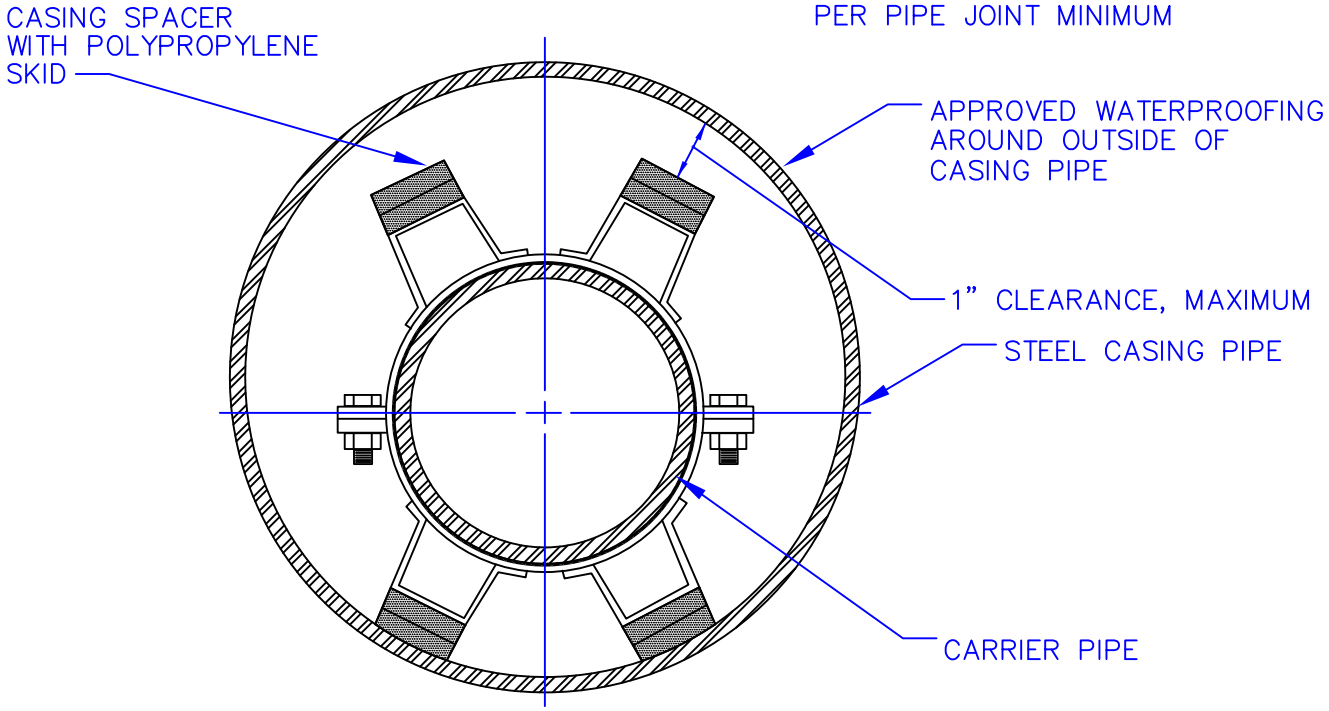
ISSUED: April 15, 2010

REVISED: _____

DRAWING NO.

C.23





CARRIER PIPE NOMINAL DIA	CASING PIPE	
	MIN OD	MIN WALL THICK
6"	16"	0.250"
8"	18"	0.282"
12"	22"	0.344"
16"	28"	0.406"
20"	32"	0.469"

DRAWN BY: WMJ

CHECKED BY:

APPROVED BY:

UNIVERSITY OF COLORADO

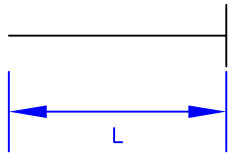
PIPE CASING WITH CASING SPACERS

ISSUED: JUNE 5, 2012

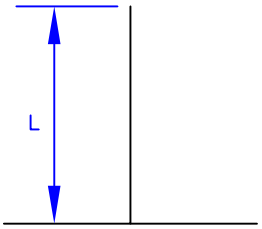
REVISED:

DRAWING NO.

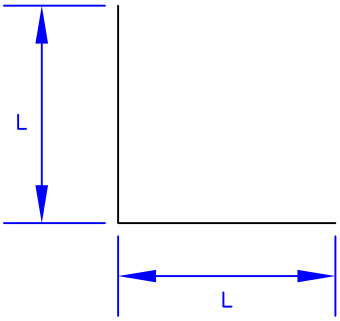
C24



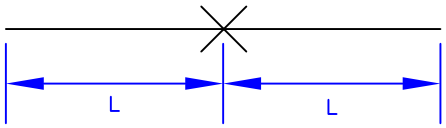
DEAD END



TEE



BENDS



VALVE

LENGTH OF RESTRAINED PIPE

NOMINAL PIPE DIAMETER	4”	6”	8”	12”	16”	20”	24”
90 DEG BEND, TEE, DEAD END	30’	45’	60’	86’	108’	132’	155’
VALVE	30’	45’	60’	86’	108’	132’	155’
45 DEG BEND	9’	13’	18’	25’	32’	39’	45’
22.5 DEG BEND	2’	4’	5’	7’	8’	10’	12’
11.25 DEG BEND	2’	2’	2’	2’	2’	3’	3’

NOTES:
1. LENGTH OF RESTRAINED PIPE MEASURED EACH WAY FROM VALVES AND BENDS.
2. CROSSES MUST BE RESTRAINED IN ALL DIRECTIONS.
3. WHEN REDUCERS ARE USED ON A VALVE INSTALLATION THE LENGTH OF RESTRAINT SHALL BE BASED ON PIPE SIZE NOT VALVE SIZE.

DRAWN BY: WMJ

CHECKED BY:

APPROVED BY:

UNIVERSITY OF COLORADO

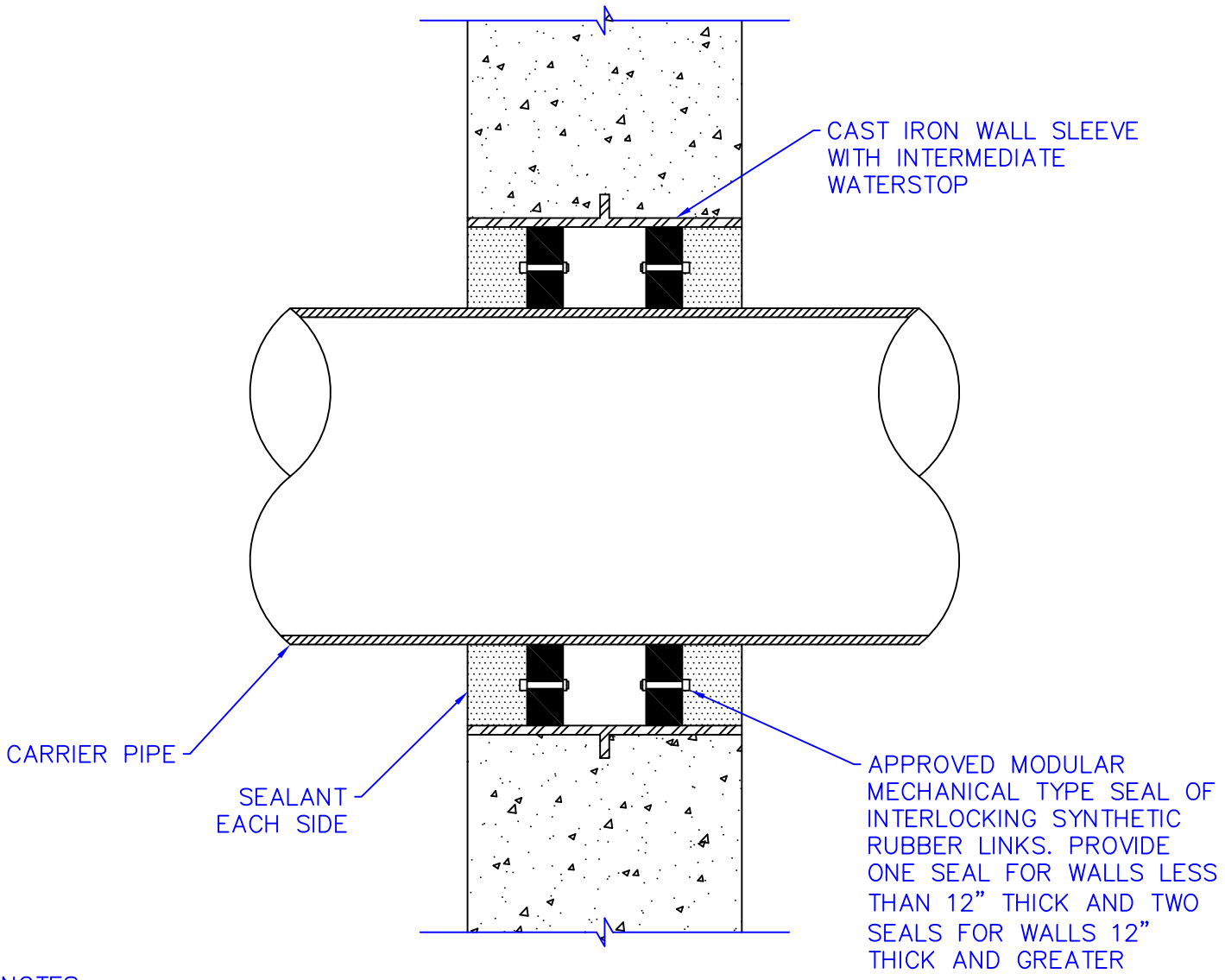
LENGTH OF RESTRAINED PIPE

ISSUED: JUNE 2012

REVISED:

DRAWING NO.

C25



NOTES:

1. CORE DRILL OPENING PER SEAL MANUFACTURER'S REQUIREMENTS FOR EXISTING WALLS.
2. INSIDE DIAMETER OF SLEEVE SHALL BE DETERMINED ACCORDING TO SEAL MANUFACTURER'S REQUIREMENTS DEPENDING ON CARRIER PIPE OUTSIDE DIAMETER.
3. INTERMEDIATE WATERSTOP TO BE CENTERED WITHIN WALL UNLESS NOTED OTHERWISE.

DRAWN BY: WMJ

CHECKED BY:

APPROVED BY:

UNIVERSITY OF COLORADO

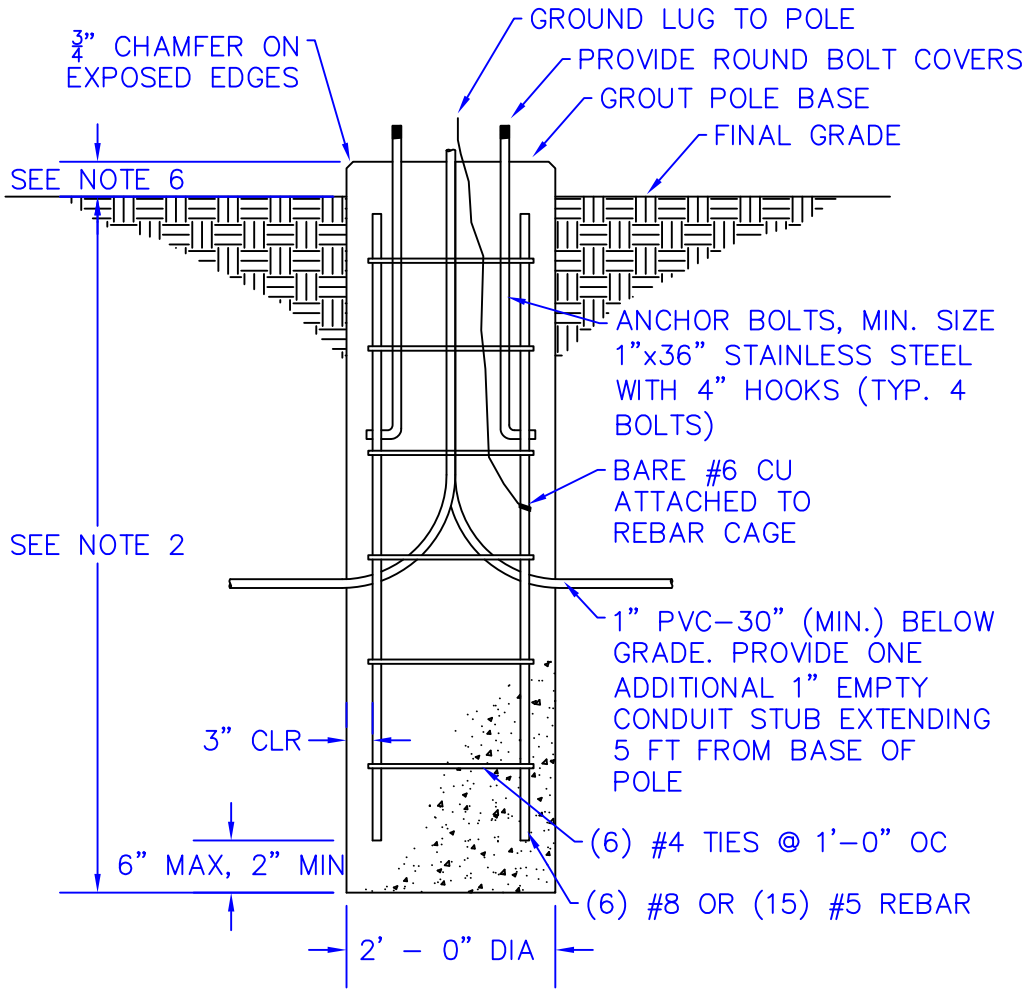
MECHANICAL SEAL WALL PENETRATION

ISSUED: JUNE 2012

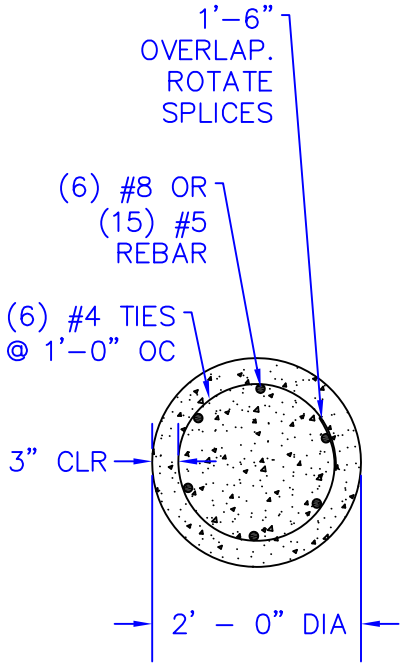
REVISED:

DRAWING NO.

C26



TYP. CONCRETE LIGHT STANDARD FOUNDATION



TYP. FOUNDATION SECTION

NOTES:

1. DIMENSIONS FOR THE ANCHOR BASE AND ANCHOR BOLTS ARE VARIABLE FOR THE HEIGHT OF THE LIGHT STANDARD AND THE MAST ARM CONFIGURATION. ALL COMPONENTS SHALL FIT AND ACCOMMODATE THE REQUIREMENTS OF THE LIGHT STANDARD SUPPLIED. FIELD MODIFICATIONS ON ANY COMPONENTS SHALL BE APPROVED BY A LICENSED STRUCTURAL ENGINEER AND UCB.
2. FOUNDATION SHALL BE 7 FT. FOR LIGHT STANDARDS 20 FT. THROUGH 40 FT., AND 6 FT. FOR LIGHT STANDARDS LESS THAN 20 FT.
3. LIGHT STANDARD FOUNDATION DEPTH IS BASED ON A MAXIMUM POLE HEIGHT OF 40 FT. IN STIFF CLAY WITH N > 8 OR MEDIUM SAND WITH N > 15 AS DETERMINED BY ASTM D 1586 STANDARD PENETRATION TEST.
4. FOUNDATIONS FOR LIGHT POLE STANDARDS HIGHER THAN 40 FT. OR LIGHT STANDARDS WITH MULTIPLE LUMINARIES OR BANNERS, OR VARYING SOIL OR WIND CONDITIONS, SHALL BE DESIGNED BY A LICENSED ENGINEER.
5. CONCRETE SHALL BE CLASS B, 4000 PSI COMPRESSIVE STRENGTH, WITH A MAXIMUM WATER CONTENT OF 0.48 AND A SLUMP OF 1" TO 4".
6. LIGHT POLE FOUNDATIONS SHALL EXTEND 3 FT. ABOVE GRADE IN PARKING LOTS AND 4 IN. ABOVE GRADE IN ALL OTHER LOCATIONS.

DRAWN BY: WMJ

CHECKED BY:

APPROVED BY:

UNIVERSITY OF COLORADO

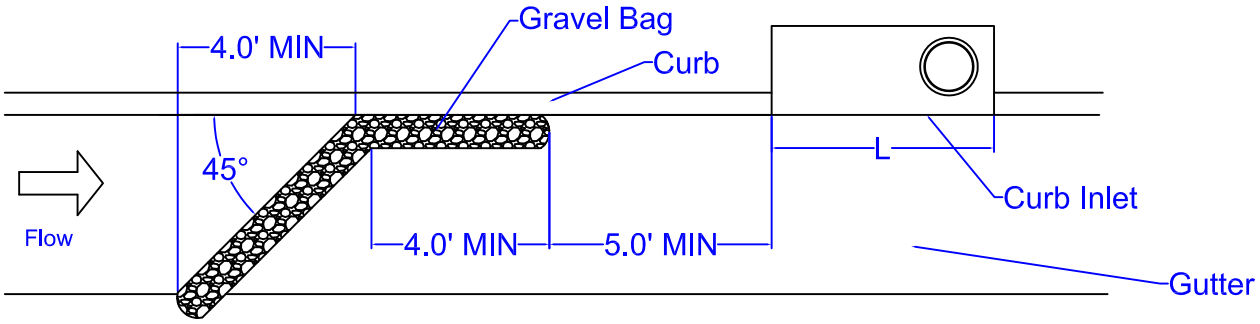
PEDESTRIAN LIGHT STANDARD DETAIL

ISSUED: AUG 2013

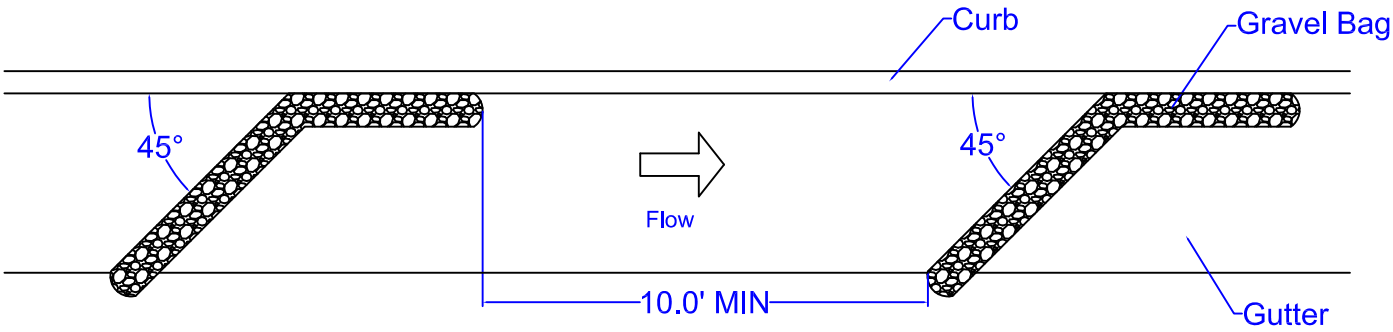
REVISED:

DRAWING NO.

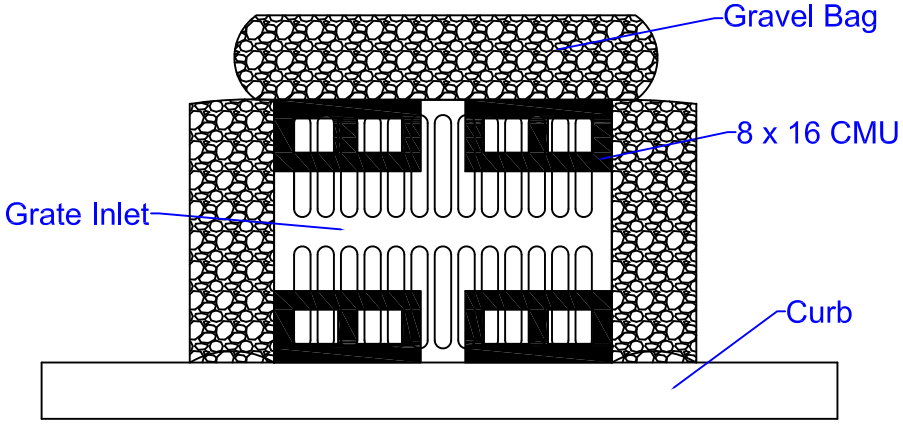
C27



PLAN VIEW OF INLET PROTECTION
NTS



PLAN VIEW OF INLET PROTECTION FOR MULTIPLE BAGS
NTS



PLAN VIEW OF GRATE INLET PROTECTION
NTS

LENGTH OF INLET (L)	NUMBER OF GRAVEL BAGS UPSTREAM OF INLET
0' - 5'	1
6' - 10'	2
L > 10'	3

Notes:
-Gravel bag shall be placed tightly against curb face and shall be placed 5'upstream from the inlet opening.
-Top of gravel bag shall be 1" below top of curb

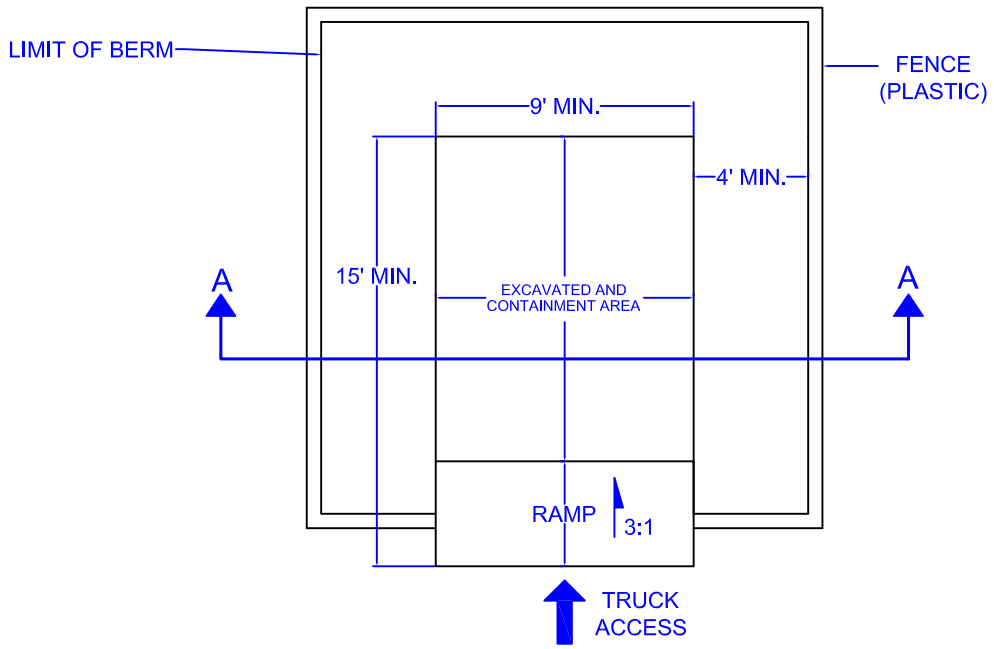
DRAWN BY: RWC
CHECKED BY:
APPROVED BY:

University of Colorado, Boulder

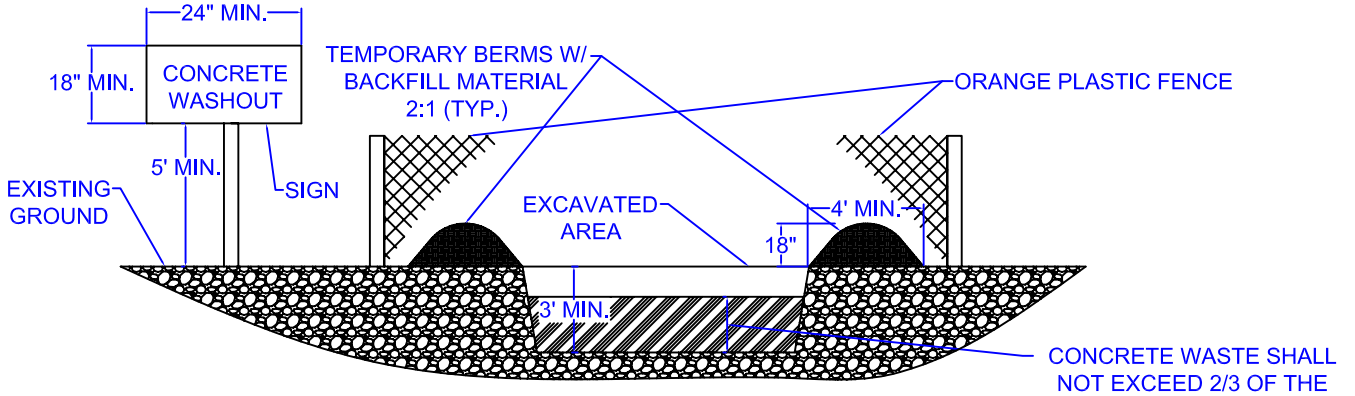
STORMWATER BMP

ISSUED: 11/22/13
REVISED:

DRAWING NO.
C-28



PLAN VIEW
NTS



SECTION A - A
NTS

NOTES:
1. A PLASTIC FENCE SHALL BE INSTALLED AROUND THE CONCRETE WASHOUT AREA, EXCEPT AT THE OPENING.
2. WASHOUT FACILITY SHALL BE LOCATED A MINIMUM OF 50 FT. FROM STORM DRAIN INLETS, OPEN DRAINAGE FACILITIES, AND WATERCOURSES UNLESS OTHERWISE AUTHORIZED BY THE UCB CIVIL ENGINEER.
3. TEMPORARY CONCRETE WASHOUT FACILITIES SHALL BE CONSTRUCTED ABOVE GRADE OR BELOW GRADE AT THE OPTION OF THE CONTRACTOR. WASHOUT FACILITY SHALL BE CONSTRUCTED AND MAINTAINED IN SUFFICIENT QUALITY AND SIZE TO CONTAIN ALL LIQUID AND CONCRETE WASTE GENERATED BY WASHOUT OPERATIONS.
4. ALL WASHOUT FACILITIES SHALL HAVE ADEQUATE PROTECTION AVAILABLE IN CASE OF RAIN AND ADVERSE WEATHER.
5. PREFABRICATED WASHOUTS MAY BE USED IF APPROVED BY THE UCB CIVIL ENGINEER.
6. CONCRETE WASHOUTS SHALL BE CONSTRUCTED/POSITIONED IN A WAY AS TO NOT CAUSE ANY FLOODING INTO CAMPUS FACILITIES.
7. THE CONTACTOR SHALL ASSUME SOLE MONETARY RESPONSIBILITY FOR ANY CLEAN-UP RESULTING FROM IMPROPER CONCRETE WASHOUT PRACTICES.

DRAWN BY: RWC

CHECKED BY:

APPROVED BY:

University of Colorado, Boulder

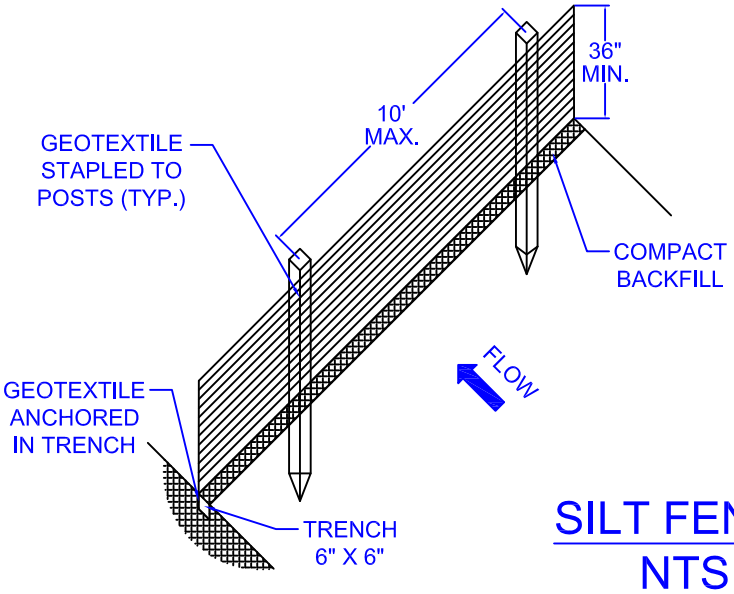
CONCRETE WASHOUT

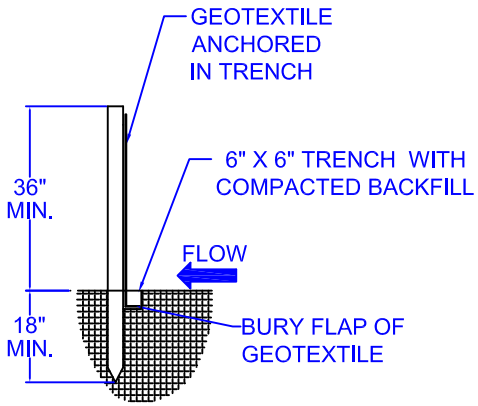
ISSUED: 12/11/13

REVISED:

DRAWING NO.

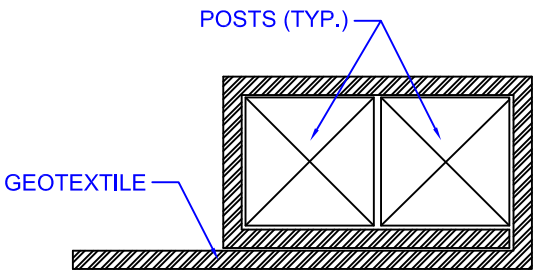
C–29





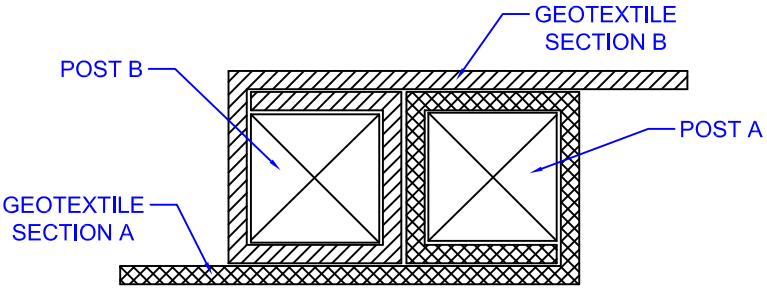
SILT FENCE
NTS

-GEOTEXTILE SHALL BE ATTACHED TO WOOD POST WITH THREE OR MORE STAPLES PER POST.
-STAPLES SHALL BE $\frac{1}{2}$"
-WOOD POST SHALL BE $1\frac{1}{2}$" x $1\frac{1}{2}$" NOMINAL



END SECTION DETAIL
NTS

-REQUIRED AT EVERY END SECTION
-GEOTEXTILE SHALL BE FOLDED AROUND TWO POSTS ONE FULL TURN. SECURE GEOTEXTILE TO POST WITH THREE STAPLES MINIMUM.



JOINING SECTION DETAIL
NTS

-REQUIRED AT EVERY JOINT
-FOLD GEOTEXTILE AROUND EACH POST ONE FULL TURN. SECURE GEOTEXTILE TO POST WITH THREE STAPLES MINIMUM. POSTS SHALL BE TIGHTLY ABUTTED WITH NO GAPS TO PREVENT POTENTIAL FLOW-THROUGH OF SEDIMENT AT JOINT.

NOTES:
1. FILTER FABRIC SHALL CONFORM TO THE REQUIREMENTS DESCRIBED IN SECTION 420 OF CDOT'S STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION AND SECTION 02230 OF THE UCB STANDARD SPECIFICATIONS.. MINIMUM HEIGHT OF THE FILTER FABRIC SHALL BE 36".
2. USE OF JOINTS SHOULD BE MINIMIZED TO IMPROVE THE STRENGTH AND EFFICIENCY OF THE BARRIER.
3. POSTS FOR SILT FENCES SHALL BE METAL OR HARD WOOD. WODDEN POSTS SHALL HAVE A MINIMUM DIAMETER OR CROSS SECTION OF $1\frac{1}{4}$". METAL POSTS SHALL BE "STUDDED TEE" OR "U" TYPE WITH A MINIMUM WEIGHT OF 1.33 LBS/FT, AND THEY SHALL BE PROTECTED AGAINST CORROSION. METAL POSTS SHALL HAVE PROJECTIONS FOR FASTENING WIRE.
4. INSTALLATION OF SILT FENCE WILL NOT BE LOCATED WITHIN DRIP LINES OF EXISTING TREES.
5. WHEN USED, WIRE FENCE REINFORCEMENT FOR THE FILTER FABRIC SHOULD BE A MINIMUM OF 36" IN HEIGHT AND A MINIMUM OF 14 GAUGE, WITH A MAXIMUM MESH SPACING OF 6".
6. SILT FENCES USED AT TOE OF SLOPES SHALL BE PLACED 5' TO 10' BEYOND TOE OF SLOPE TO PROVIDE STORAGE CAPACITY.

DRAWN BY: RWC
CHECKED BY:
APPROVED BY:

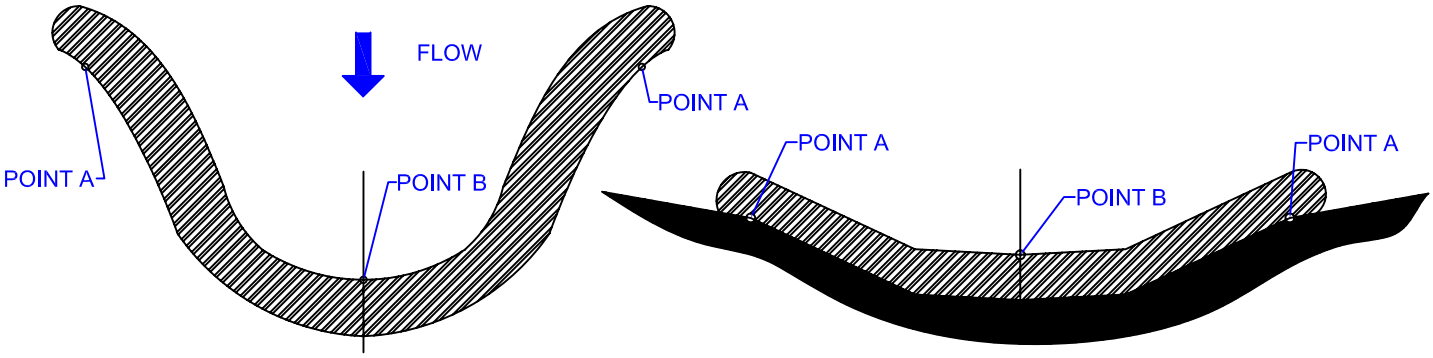
University of Colorado, Boulder

SILT FENCES

ISSUED: 12/11/13
REVISED:

DRAWING NO.
C-30

EROSION LOG DITCH INSTALLATION

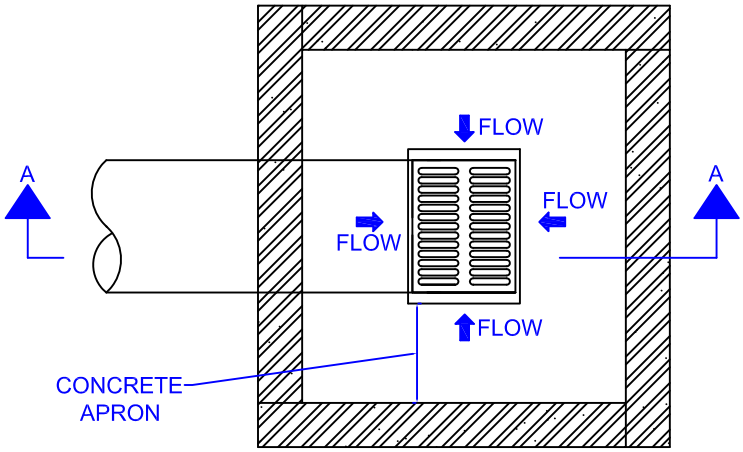


PLAN VIEW
NTS

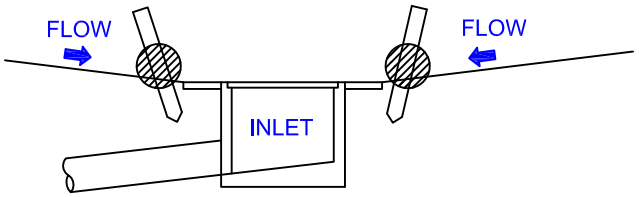
ELEVATION
NTS

NOTES:
1. POINTS A SHALL BE A MINIMUM OF 1' HIGHER THAN POINT B.
2. EROSION LOGS SHALL BE EMBEDDED 2 INCHES INTO THE SOIL.
3. WOODEN STAKES SHALL BE $1\frac{1}{2}$" x $1\frac{1}{2}$" NOMINAL AND EMBEDDED TO A MINIMUM DEPTH OF 12".
4. EROSION LOGS SHALL BE TIGHTLY ABUTTED WITH NO GAPS.

EROSION LOG FILTER AT DROP INLET



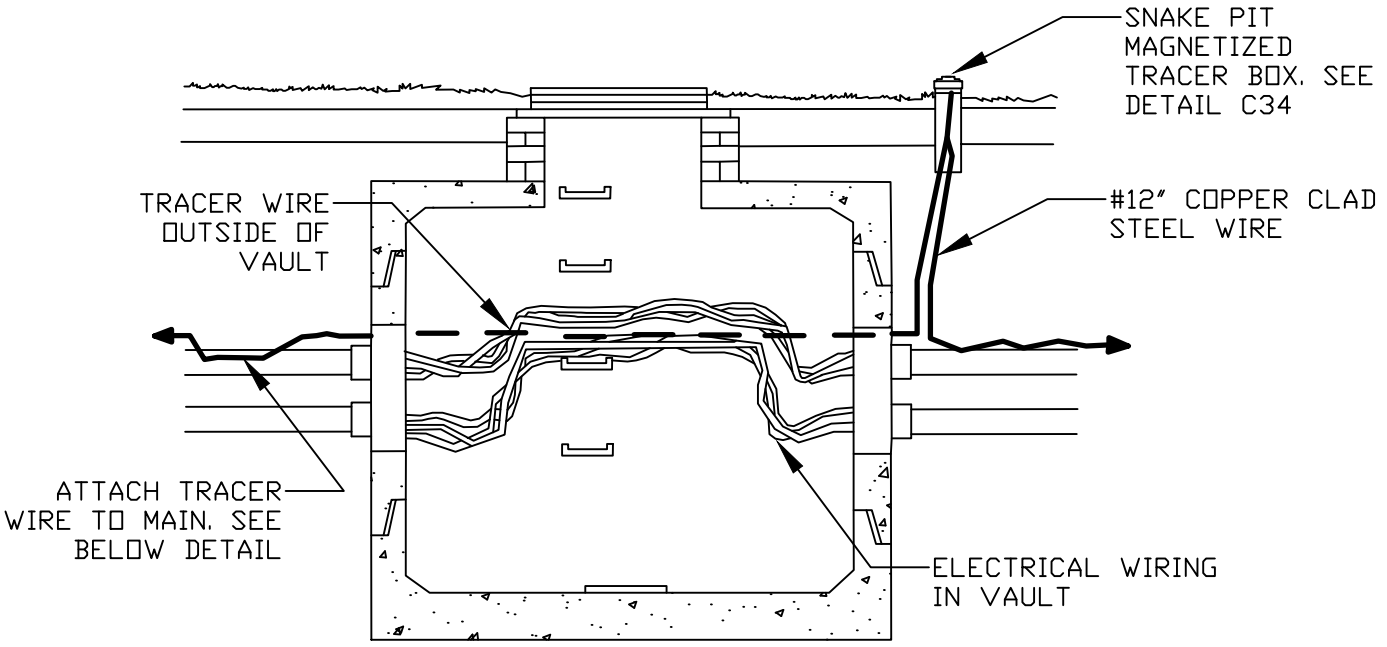
PLAN VEIW
NTS

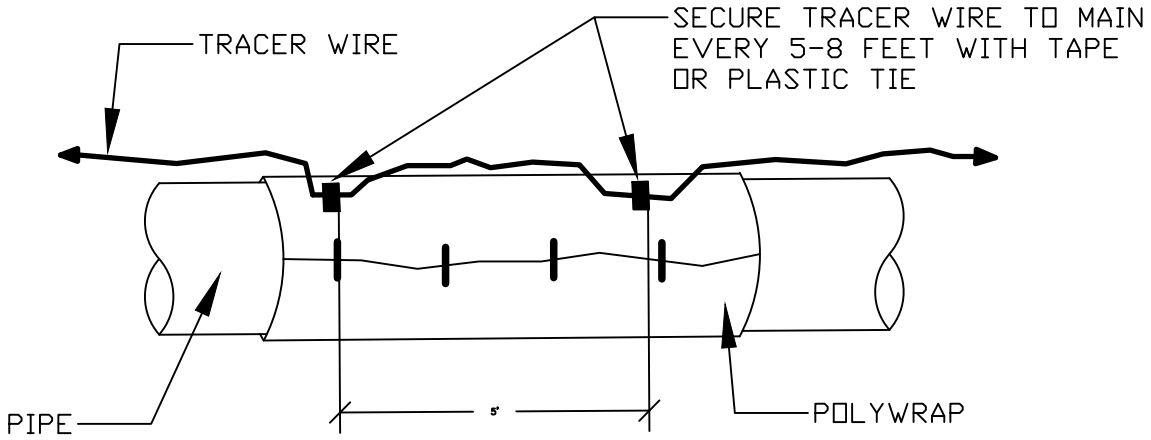


SECTION A - A
NTS

NOTES:
1. LOCATE EROSION LOGS AT THE OUTSIDE EDGE OF THE CONCRETE APRON

DRAWN BY: RWC CHECKED BY: APPROVED BY:	University of Colorado, Boulder EROSION LOGS	ISSUED: 12/09/13 REVISED: DRAWING NO. C-31





NOTES:

1. TRACER WIRE FOR ALL UTILITIES SHALL BE BROUGHT UP TO SURFACE OUTSIDE OF PIPE AND TERMINATED IN TEST STATION AS SHOWN. ACCESS POINTS SHALL BE LOCATED AT LEAST EVERY 250 FEET, AND AT EVERY POINT WHERE THE UTILITY SERVED BY THE TRACER WIRE HAS ANOTHER PHYSICAL ACCESS POINT. SEE DETAIL C34 FOR SNAKE PIT DETAILS ALONG UTILITY LINES.
2. TRACER WIRE SHALL BE INSTALLED IN A CONTINUOUS FASHION BETWEEN ACCESS POINTS.IF A TRACER WIRE MUST BE JOINED BELOW GROUND, WIRE MUST BE JOINED IN PERMANENT BOND. SEE EITHER DETAIL C34 OR C35, WHICHEVER APPLIES.
3. TRACER WIRE SHALL BE ATTACHED TO TOP OF PIPE THROUGH TAPE OR PLASTIC WIRE AT 5–8 FOOT INTERVALS, EXCEPT FOR FUEL AND GAS LINES WHICH ARE TO BE FASTENED USING COPPERHEAD TRACERSPACER AT THE SAME INTERVAL.
4. TRACER WIRE SHALL BEGIN AND TERMINATE AT A COPPERHEAD SUPER ROD MAGNESIUM ANODE. SEE DETAIL C35.

DRAWN BY: FM–JB

CHECKED BY:

APPROVED BY:

University of Colorado

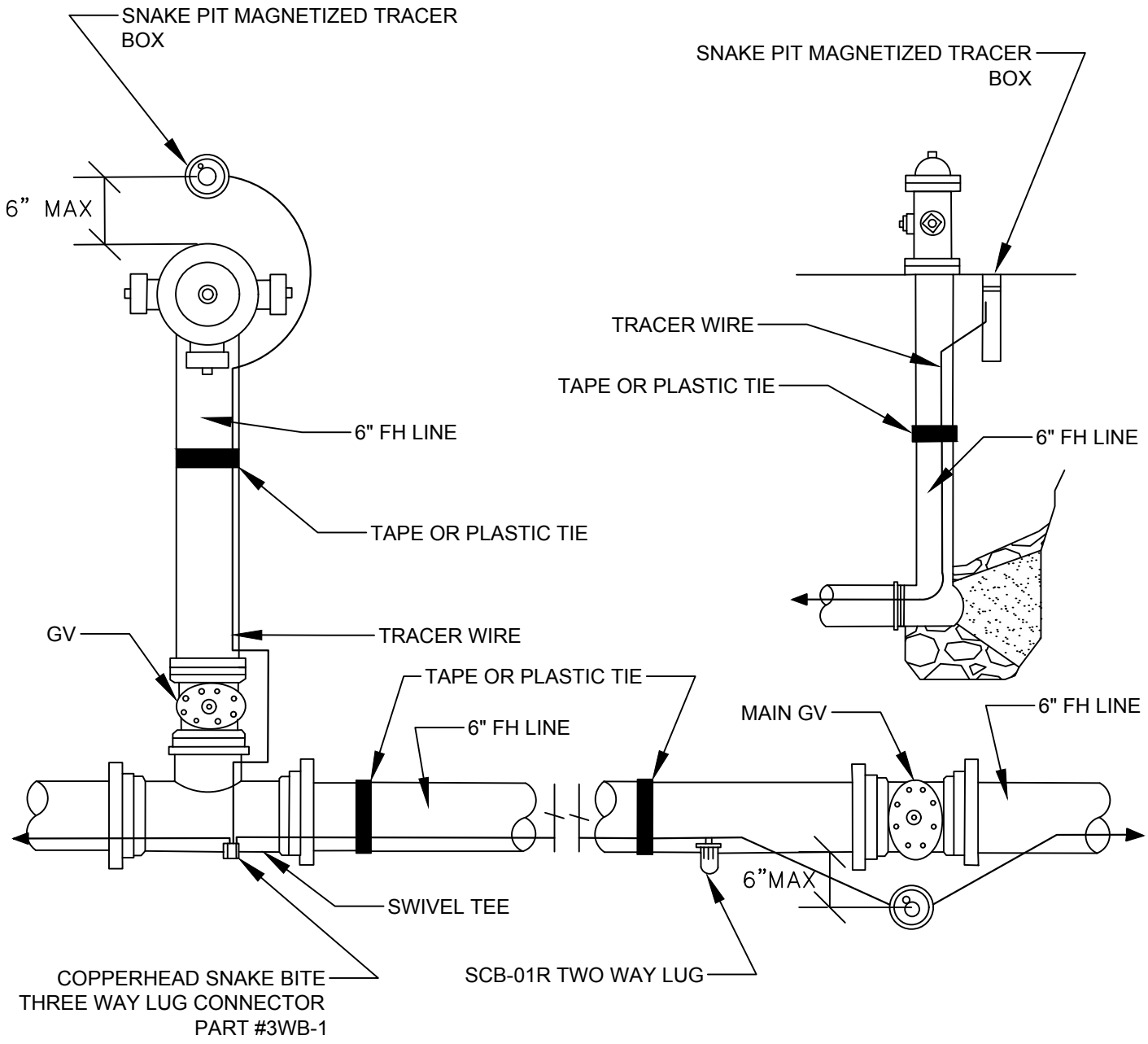
TRACER WIRE PLACEMENT

ISSUED:

REVISED: _____

DRAWING NO.

C32

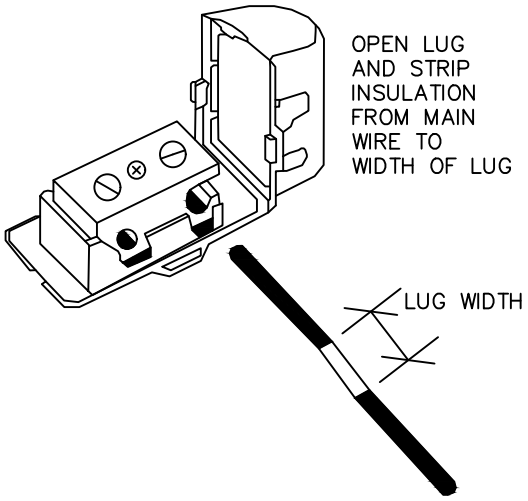


NOTES:

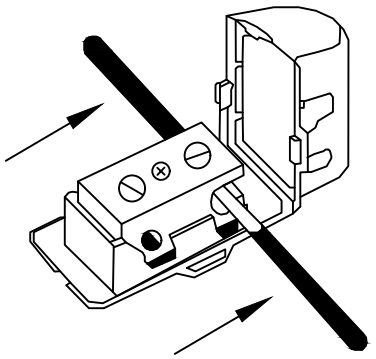
1. TRACER WIRE FOR ALL UTILITIES SHALL BE BROUGHT UP TO SURFACE OUTSIDE OF PIPE AND TERMINATED IN TEST STATION AS SHOWN. ACCESS POINTS SHALL BE LOCATED AT LEAST EVERY 250 FEET, AND AT EVERY POINT WHERE THE UTILITY SERVED BY THE TRACER WIRE HAS ANOTHER PHYSICAL ACCESS POINT.
2. TRACER WIRE SHALL BE INSTALLED IN A CONTINUOUS FASHION BETWEEN ACCESS POINTS. IF A TRACER WIRE MUST BE JOINED BELOW GROUND, WIRE MUST BE JOINED IN PERMANENT BOND. SEE EITHER DETAIL C34 OR C35, WHICHEVER APPLIES.
3. TRACER WIRE SHALL BE ATTACHED TO TOP OF PIPE THROUGH TAPE OR PLASTIC WIRE AT 5–8 FOOT INTERVALS, EXCEPT FOR FUEL AND GAS LINES WHICH ARE TO BE FASTENED USING COPPERHEAD TRACERSPACER AT THE SAME INTERVAL.
4. TRACER WIRE SHALL BEGIN AND TERMINATE AT A COPPERHEAD SUPER ROD MAGNESIUM ANODE. SEE DETAIL C35.

DRAWN BY: FM–JB CHECKED BY: APPROVED BY:	University of Colorado MAGNETIZED SNAKEPIT	ISSUED: REVISED: _____ DRAWING NO. C33

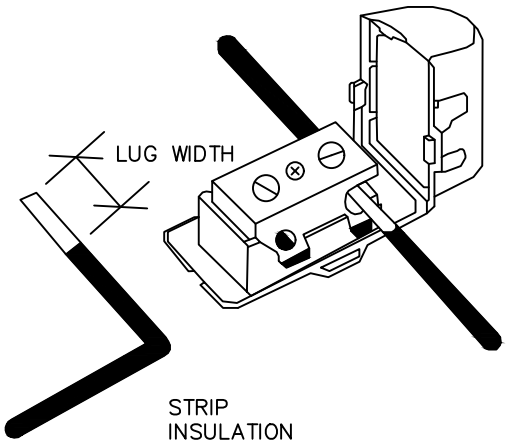
STEP 1



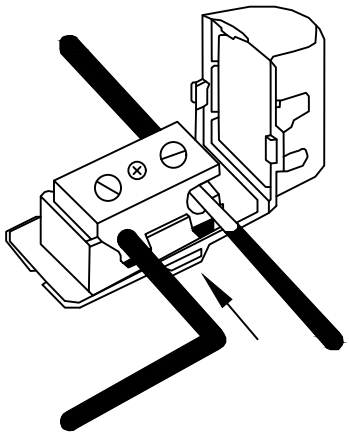
STEP 2



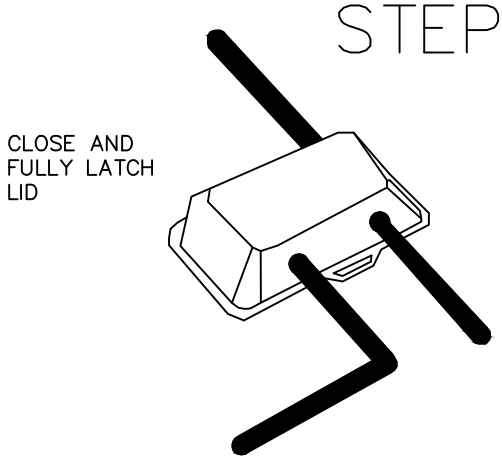
STEP 3



STEP 4



STEP 5



NOTES:

1. STRIP 5/8" OF INSULATION FROM END OF EACH WIRE.
2. INSERT TWO STRIPPED ENDS FIRMLY INTO DIRECT BURY WIRE NUT.
3. TWIST WIRE NUT CLOCKWISE WHILE PUSHING WIRES FIRMLY INTO NUT.
4. SONNECTOR VARIES BY APPLICATION AND UTILITY, REFER TO STANDARD 02410 FOR DETAILS.

DRAWN BY: FM–JB

CHECKED BY:

APPROVED BY:

University of Colorado

JOINING TRACER WIRE LUG CONNECTION

ISSUED:

REVISED: _____

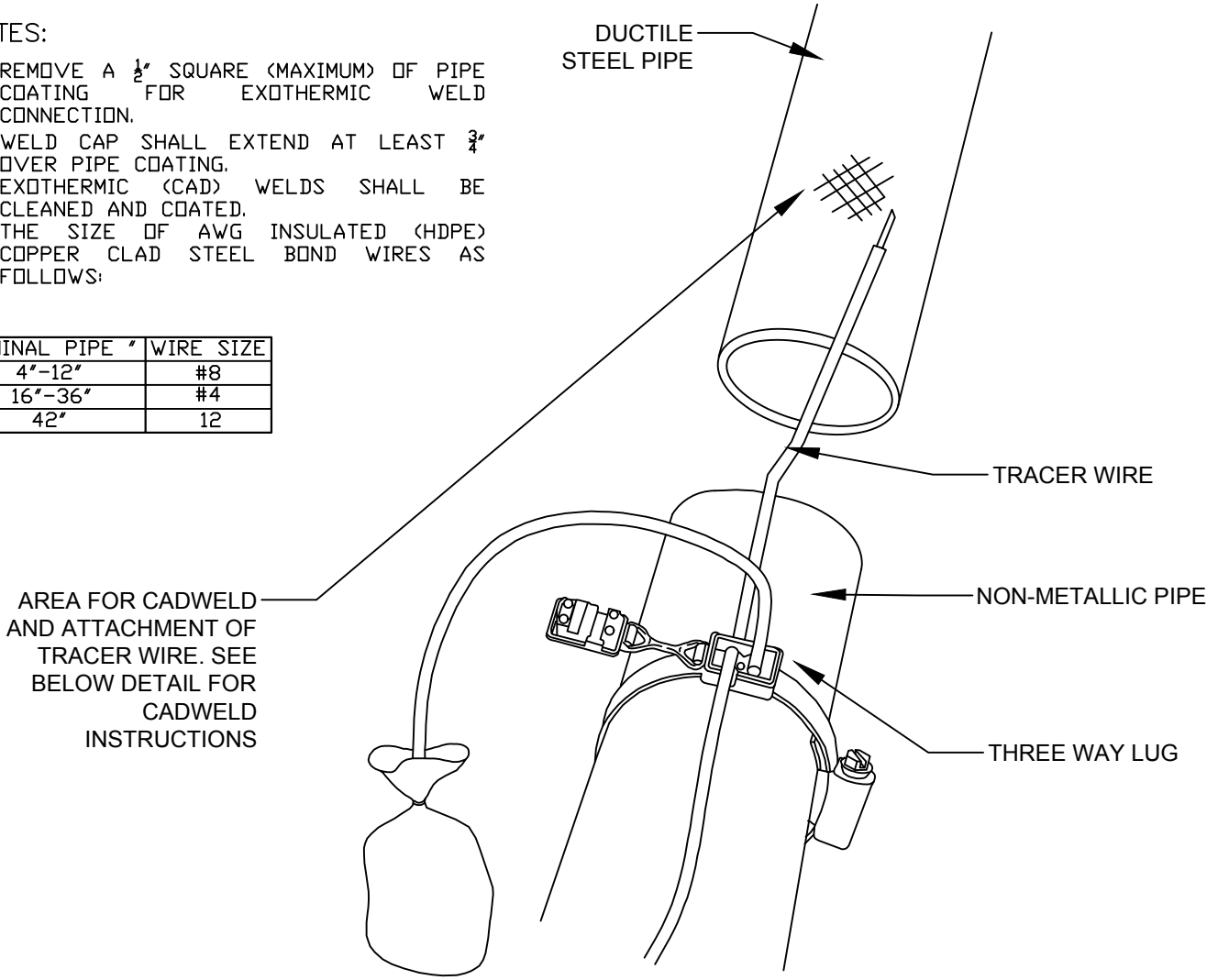
DRAWING NO.

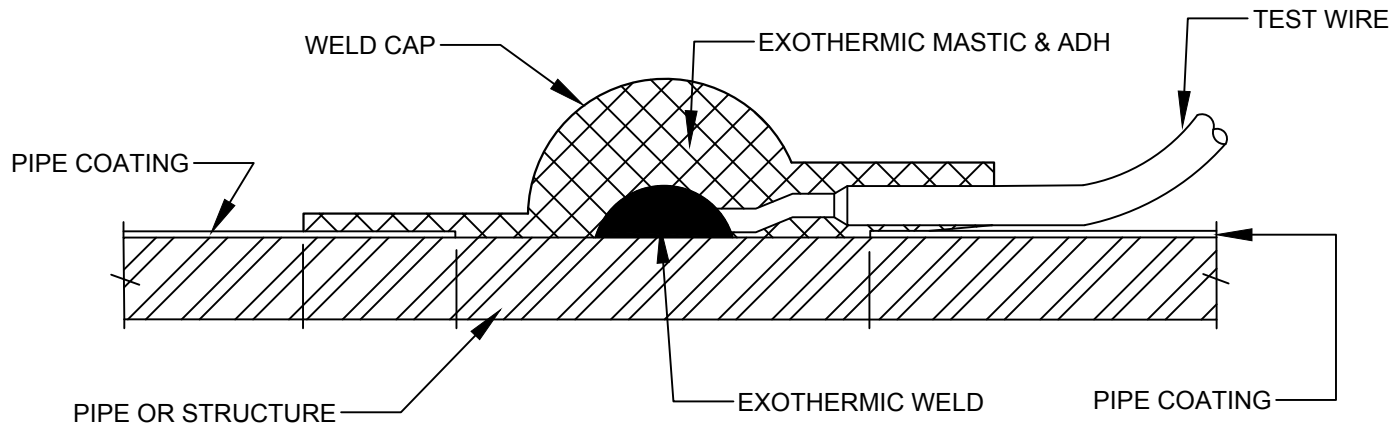
C34

NOTES:

1. REMOVE A ½" SQUARE (MAXIMUM) OF PIPE COATING FOR EXOTHERMIC WELD CONNECTION.
2. WELD CAP SHALL EXTEND AT LEAST ¾" OVER PIPE COATING.
3. EXOTHERMIC (CAD) WELDS SHALL BE CLEANED AND COATED.
4. THE SIZE OF AWG INSULATED (HDPE) COPPER CLAD STEEL BOND WIRES AS FOLLOWS:

NOMINAL PIPE "	WIRE SIZE
4"-12"	#8
16"-36"	#4
42"	12





DRAWN BY: FM-JB

CHECKED BY:

APPROVED BY:

University of Colorado

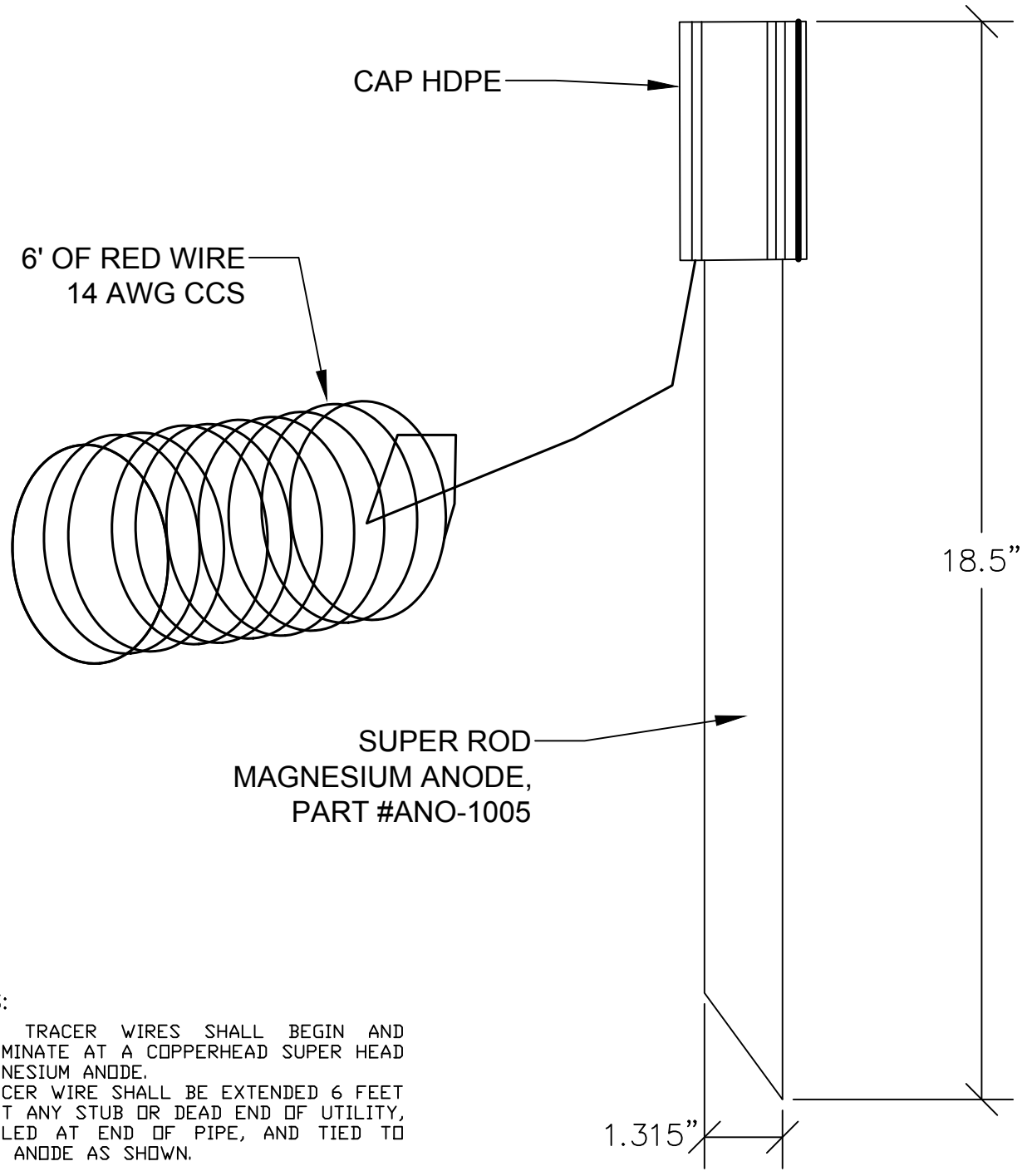
JOINING TRACER WIRE CAD WELD CONNECTION

ISSUED:

REVISED: _____

DRAWING NO.

C35



NOTES:

1. ALL TRACER WIRES SHALL BEGIN AND TERMINATE AT A COPPERHEAD SUPER HEAD MAGNESIUM ANODE.
2. TRACER WIRE SHALL BE EXTENDED 6 FEET PAST ANY STUB OR DEAD END OF UTILITY, CURLED AT END OF PIPE, AND TIED TO THE ANODE AS SHOWN.

DRAWN BY: FM–JB

CHECKED BY:

APPROVED BY:

University of Colorado

GROUNDING ANODE

ISSUED:

REVISED:

DRAWING NO.

C36

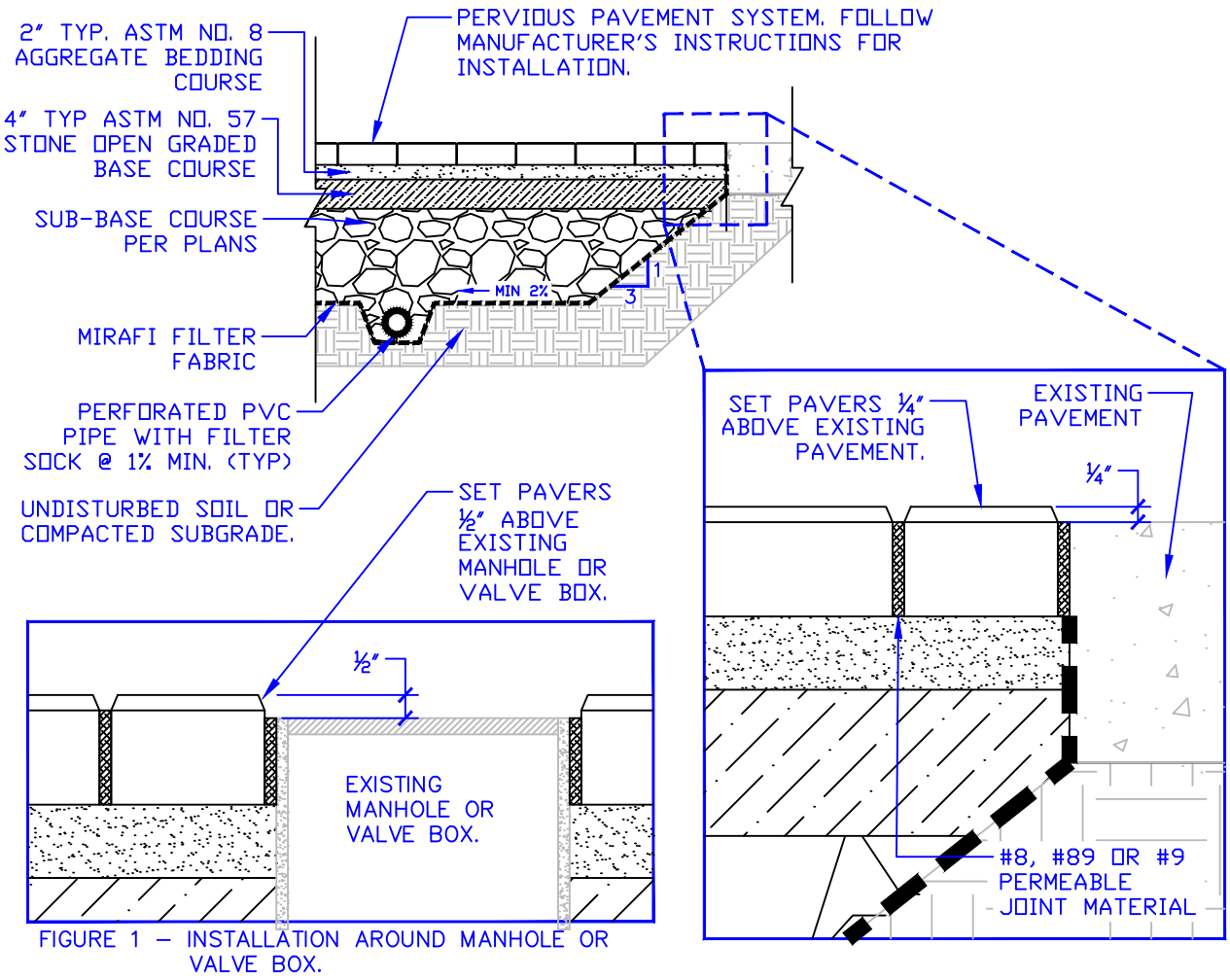


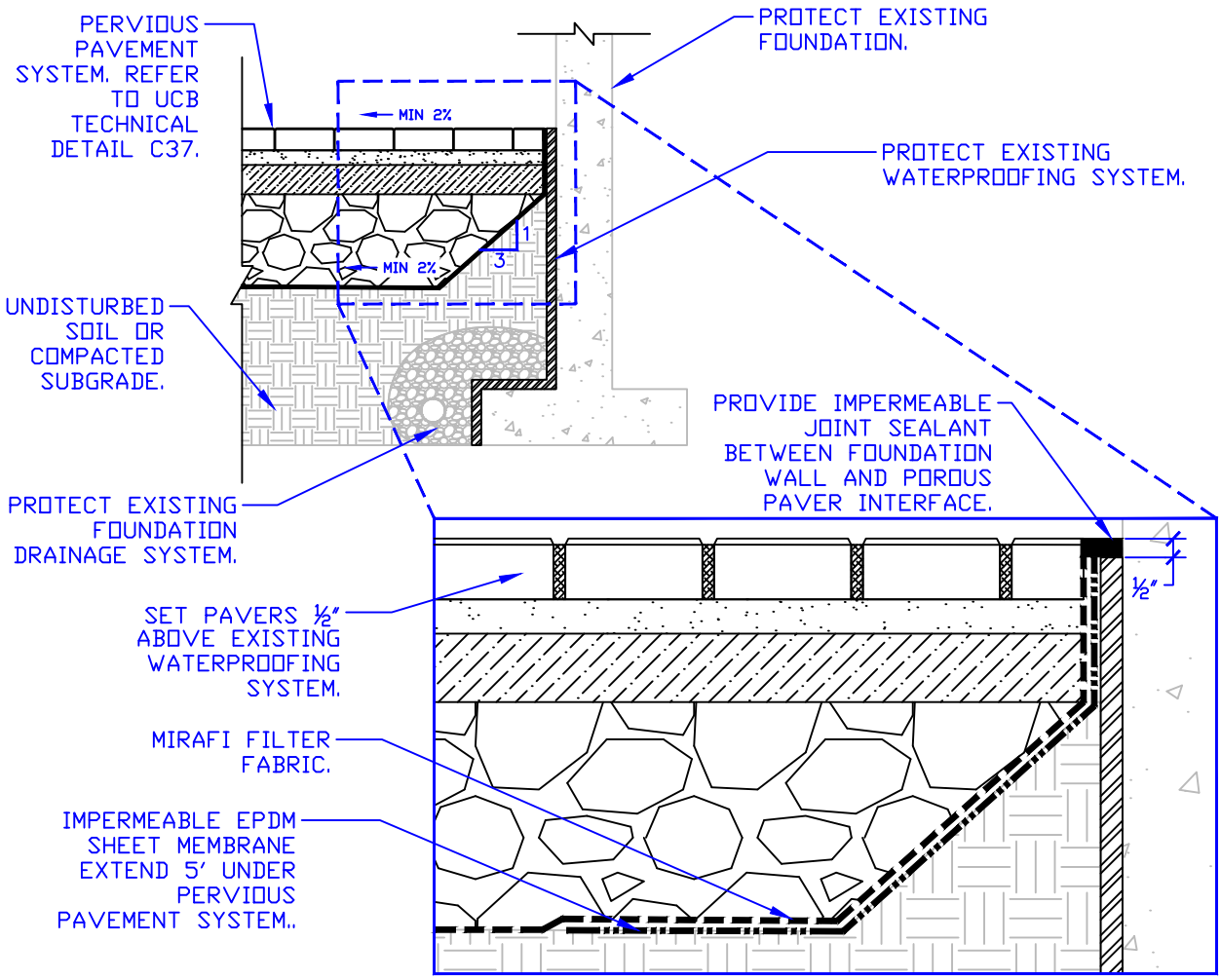
FIGURE 1 – INSTALLATION AROUND MANHOLE OR VALVE BOX.

NOTES:

1. PERVIOUS PAVEMENT SYSTEM SHALL CONFORM TO UCB STANDARD 02515 OR APPROVED ALTERNATIVE. WRITTEN APPROVAL FROM UCB CIVIL ENGINEER IS REQUIRED FOR ALTERNATIVE SYSTEM.
2. UCB INSPECTOR SHALL OBSERVE PLACEMENT OF GEOTEXTILE, SUB-BASE COURSE, BASE COURSE, BEDDING COURSE AND PAVERS.
3. A TESTING AGENCY SHALL CONDUCT IN-PLACE DENSITY TESTING PER ASTM D 4254, OR APPROVED ALTERNATIVE. WRITTEN APPROVAL FROM UCB CIVIL ENGINEER IS REQUIRED FOR ALTERNATIVE DENSITY TESTING METHODS.
4. ALL TESTING SHALL BE PERFORMED BY AN INDEPENDENT TESTING AND INSPECTION AGENCY EMPLOYED BY UCB.
5. INSTALLATION CONTRACTOR SHALL RETURN TO SITE AFTER 11 MONTHS FROM COMPLETION OF WORK AND PROVIDE INITIAL MAINTENANCE AS REQUIRED BY UCB CIVIL ENGINEER WITH NO ADDITIONAL COMPENSATION.

NTS

DRAWN BY: GP CHECKED BY: WM APPROVED BY: JA	University of Colorado POROUS PAVERS EDGE DETAIL	ISSUED: JULY 2016 REVISED: _____ DRAWING NO. C37



NOTES:

1. PERVIOUS PAVEMENT SYSTEM SHALL CONFORM TO UCB STANDARD 02515 OR APPROVED ALTERNATIVE. WRITTEN APPROVAL FROM UCB CIVIL ENGINEER IS REQUIRED FOR ALTERNATIVE SYSTEM.
2. REFER TO UCB TECHNICAL DETAIL C37 FOR PERVIOUS PAVEMENT SYSTEM.
3. EXTEND EPDM IMPERMEABLE SHEET MEMBRANE MINIMUM 5 FEET UNDER PERVIOUS PAVEMENT SYSTEM.
4. CONTRACTOR SHALL SUMBIT DESIRE PRODUCT TO UCB CIVIL ENGINEER FOR REVIEW AND APPROVAL FOR IMPERMEABLE EPDM SHEET MEMBRANE AND IMPERMEABLE JOINT SEALANT.
5. UCB INSPECTOR SHALL OBSERVE PLACEMENT OF GEOTEXTILE, SUB-BASE COURSE, BASE COURSE, BEDDING COURSE AND PAVERS.
6. A TESTING AGENCY SHALL CONDUCT IN-PLACE DENSITY TESTING PER ASTM D 4254, OR APPROVED ALTERNATIVE. WRITTEN APPROVAL FROM UCB CIVIL ENGINEER IS REQUIRED FOR ALTERNATIVE DENSITY TESTING METHODS.
7. ALL TESTING SHALL BE PERFORMED BY AN INDEPENDENT TESTING AND INSPECTION AGENCY EMPLOYED BY UCB.
8. INSTALLATION CONTRACTOR SHALL RETURN TO SITE AFTER 11 MONTHS FROM COMPLETION OF WORK AND PROVIDE INITIAL MAINTENANCE AS REQUIRED BY UCB CIVIL ENGINEER WITH NO ADDITIONAL COMPENSATION.

NTS

DRAWN BY: GP

CHECKED BY: WM

APPROVED BY: JA

University of Colorado

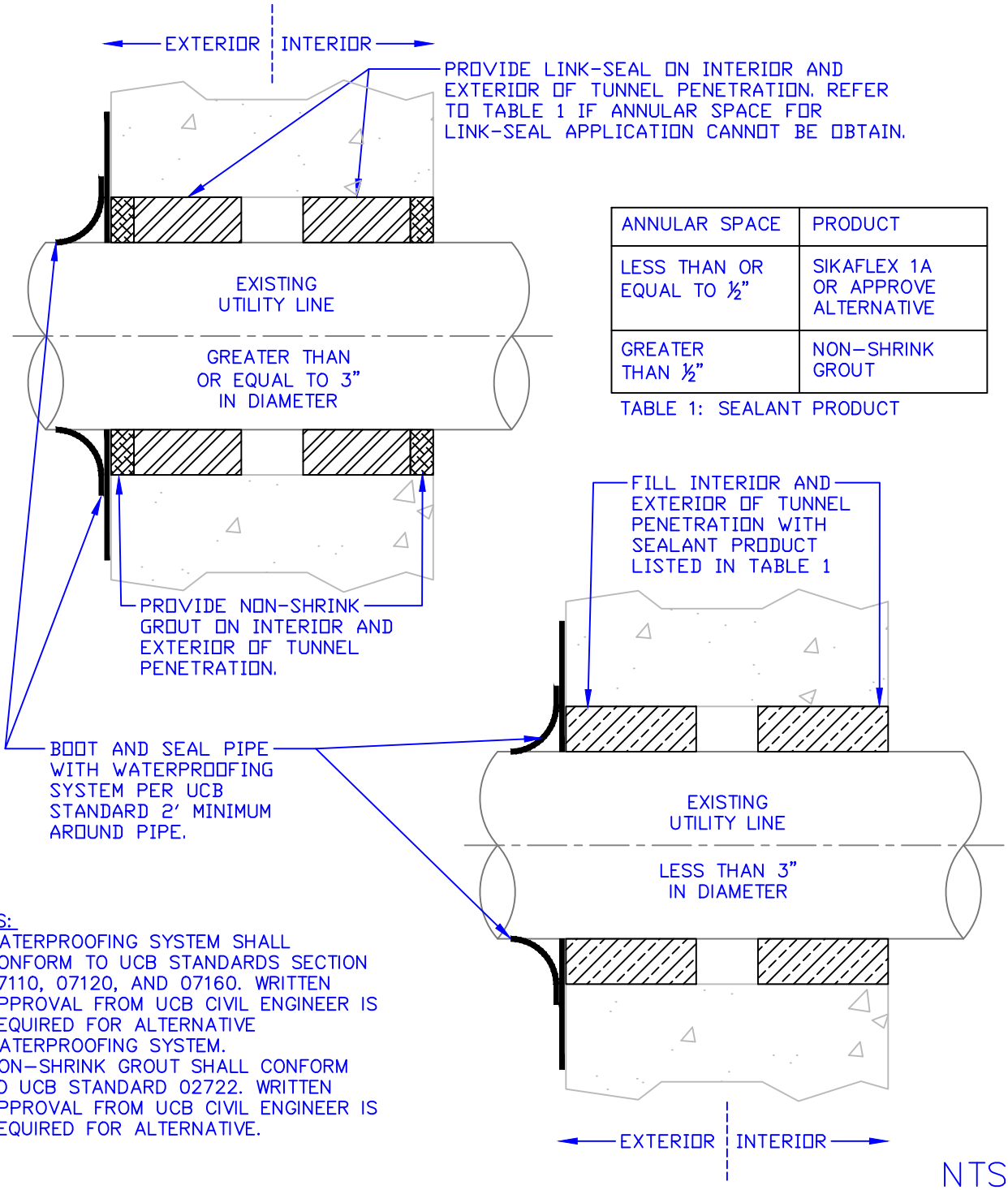
POROUS PAVERS DETAIL (ADJACENT TO BUILDING)

ISSUED: JULY 2016

REVISED: _____

DRAWING NO.

C38



ANNULAR SPACE	PRODUCT
LESS THAN OR EQUAL TO ½"	SIKAFLEX 1A OR APPROVE ALTERNATIVE
GREATER THAN ½"	NON-SHRINK GROUT

TABLE 1: SEALANT PRODUCT

NTS

NOTES:

1. WATERPROOFING SYSTEM SHALL CONFORM TO UCB STANDARDS SECTION 07110, 07120, AND 07160. WRITTEN APPROVAL FROM UCB CIVIL ENGINEER IS REQUIRED FOR ALTERNATIVE WATERPROOFING SYSTEM.
2. NON-SHRINK GROUT SHALL CONFORM TO UCB STANDARD 02722. WRITTEN APPROVAL FROM UCB CIVIL ENGINEER IS REQUIRED FOR ALTERNATIVE.

DRAWN BY: JB, GP

CHECKED BY: WM

APPROVED BY: JA

University of Colorado

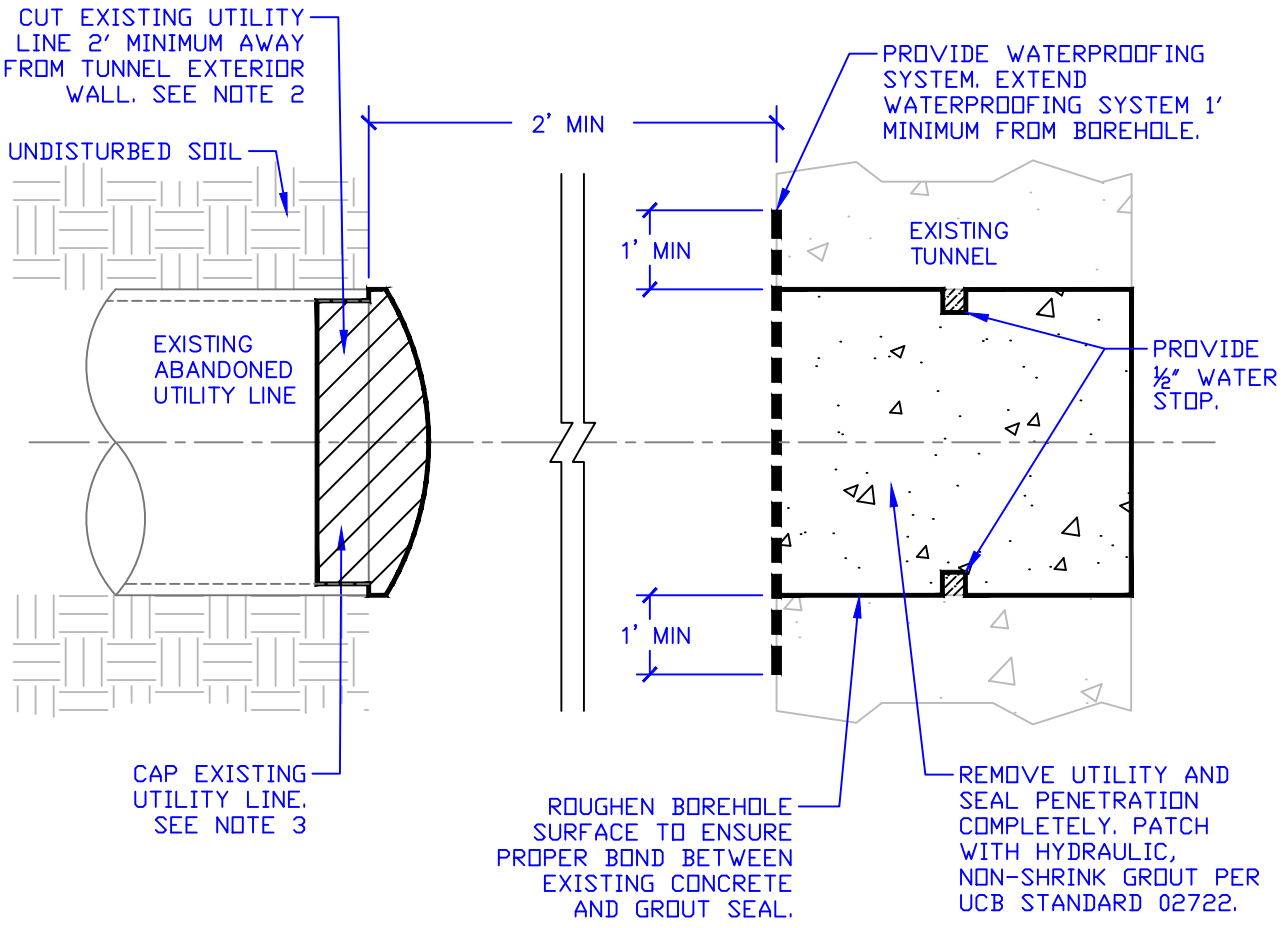
TUNNEL PENETRATION SEALING (LIVE UTILITIES)

ISSUED: NOV 2015

REVISED: _____

DRAWING NO.

C39



NOTES:

1. WATERPROOFING SYSTEM SHALL CONFORM TO UCB STANDARDS SECTION 07110, 07120, AND 07160. WRITTEN APPROVAL FROM UCB CIVIL ENGINEER IS REQUIRED FOR ALTERNATIVE WATERPROOFING SYSTEM.
2. CUT EXISTING UTILITY LINE 2' MINIMUM AWAY FROM TUNNEL EXTERIOR WALL UPON APPROVAL FROM UCB CIVIL ENGINEER.
3. CAP EXISTING UTILITY LINE. CONTRACTOR SHALL SUBMIT DESIRED PRODUCT TO UCB CIVIL ENGINEER FOR REVIEW AND APPROVAL. ENSURE WATERPROOFING FOR UTILITY CAP. SUFFICIENT STRENGTH IS REQUIRED TO WITHSTAND HYDROSTATIC AND/OR EARTH PRESSURES.

NTS

DRAWN BY: JB, GP

CHECKED BY: WM

APPROVED BY: JA

University of Colorado

TUNNEL PENETRATION SEALING (ABANDONED UTILITIES)

ISSUED: NOV 2015

REVISED: _____

DRAWING NO.

C40